CHASSIS PLANS
Systems Engineered to Perform®

TFX1-19

Rugged Military Grade
Rack Mount 19-Inch
Trifold LCD Panel

Technical Reference

Revision A
6/25/2013
22008700

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Return company address and contact
Model name and model # from the label on the back of the display
Serial number from the label on the back of the display
Description of the failure

An RMA number will be issued. Mark the RMA number clearly on the outside of each box, include a failure report for each board and return the product(s) to our San Diego, CA facility:

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10123 Carroll Canyon Rd.
San Diego, CA 92131
Attn: Repair Department

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Chapter 1 - Introduction

Description

The TFX1-19 is a rugged military grade and industrial grade high performance 2U rack mounted trifold LCD display offering three 19-inch TFT LCD displays with LED backlight. The display offers an optional bonded anti-reflective glass cover with an optional EMI filter.

The TFX1-19 family is designed to meet MIL-S-901D and MIL-STD-810G and includes solid and lightweight 5052-H32 aluminum construction and locking stainless hardware throughout.

Two LCD modules are offered: standard 350 nit brightness and a wide-temperature range 1500 nit high bright panel for direct sunlight availability.

Both displays offer 1280 x 1024 native resolution and LED backlighting. Pixel pitch for both panels is .294 x .294mm in an RGB vertical stripe format with 16.7 million colors (True Color). The following table details other specifications.

	TFX1-191	**TFX1-192**
Brightness	350 nit	1500 nit
Contrast Ratio	1000:1	800:1
Viewing Angle	85 hor° / 80° vert	80° hor / 80° vert
Response Time	5ms	16ms
Operating Temp	0 to +50°C	-20 to +70°C
Storage Temp	-20 to +60°C	-20 to +70°C

Table 1 – LCD Module Differences

The display is offered with an option for a bonded glass overlay with a DARO oleophobic anti-reflective (AR) coating. This AR coating minimizes finger prints and repels dirt, moisture, and other contaminates to improve image clarity. The coating is highly resistant to abrasion and is easily cleaned.

An optional ITO EMI filter in front of the display is available for compliance with military EMI standards. The glass is optically bonded to the front of the display with optically clear index matched adhesive for superior viewing and ruggedness. A 6mm copper bus bar around the entire glass stack-up provides effective EMI grounding. The contrast is significantly enhanced with this Anti Reflective glass stack-up in high bright environments.

The three displays are independently controlled and are each provided with a separate high quality advanced scaling controller with a Genesis chipset and separate inputs. The rugged LCD controller offers inputs for aRGB, DVI-D, HDMI, and Composite Video. This is a specifically ruggedized controller offering as standard conformal coating with high shock/vibration and temperature extreme tolerances.

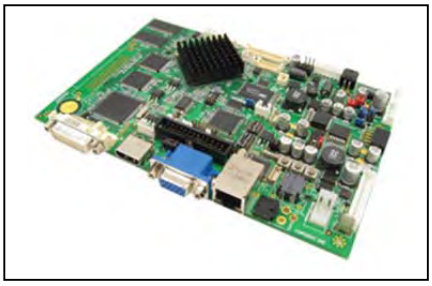
The LCD supports full screen image expansion, on-screen PIP (Picture in Picture), Picture by Picture, and image marker. Serial and Ethernet command ports offer remote panel control including on-screen text overlay generation.

Included standard is a built-in 2 watt stereo amplifier and two speakers mounted below the center LCD.

The TFX1-19 is primarily designed for rugged Military applications but can be used in Industrial, Commercial, or Broadcast applications where reliability, quality and long program life availability preclude the use of cheaply made imported units.

As with all Chassis Plans products, a wide variety of custom options can be configured per customer or application specific requirements. Contact your Sales Engineer to discuss your particular requirements.

Genesis Based LCD Controller Description



The LCD controller used in the TFX1-19 provides a robust feature set. The board features full screen image expansion, on screen PIP, and image marker. The controller supports 3x10-bit 1.06 billion colors at up to 1920x1200 resolution, easily scaling the image to the 1280 x 1024 native panel resolution of the 19-inch panels in the TFX1-19. Refresh rates of 60Hz for WUXGA and UXGA with higher refresh rates for lower resolutions available. Auto detects VGA-WUXGA, interlaced and non-interlaced. HDMI and DVI inputs support up to1920x1200 60Hz signals. This ruggedized military grade controller is rated for operating at -40 to +80 deg C, uses low mass tantalum capacitors for maximum vibration and shock tolerance and is conformal coated for extreme ruggedness. MTBF for the controllers is in excess of 100K hours.

The controller will provide input up/down scaling of virtually any input signal to scale the image to the 1280x1024 native LCD panel resolution. It provides for PC, Apple and Sun input resolutions.

DVI-D/HDMI/VGA Input Features:

Harsh Environment LCD Controller

Inputs:

Analog RGB:	75Hz at SXGA, WXGA, XGA, SVGA, VGA With auto detect of Digital Separate Sync, Sync-On-Green & Composite Sync. Auto detects VGA ~WUXGA interlaced & noninterlaced.
DVI-D/HDMI:	60Hz at WUXGA 75Hz at SXGA, WXGA, XGA, SVGA, VGA
Video:	Composite Video (BNC)
Image Scaling:	Up / down scaling to fit input to panel resolution.
Image Control:	Brightness, Contrast, Saturation, Hue, Frequency, Phase, Color temperature, Image position, Hue, Gamma.
Other Features:	System information, OSD position, Scaling to fill screen and fill to aspect ratio, OSD timeout, Factory reset, OSD menu transparency, Picture In Picture – Variable position with 18 sizes selection and Picture By Picture, Programmable hot keys

The TFX1-19 LCD controller board is based on the Genesis FLI30436 LCD Controller chip. It provides:

- Faroudja® signal processing including TrueLife™ Video Enhancer
- Next generation 10-bit Faroudja DCDi Cinema® format conversion
- Dual 10 bit video decoders for up to 1.06 billion colors
- VBI support for Teletext, Closed Captioning V-Chip and other services
- Worldwide video standard support
- Picture-in-Picture (PIP) and Picture-byPicture (PBP)
- Analog Video Capture up to 162 MHz (up to WUXGA 1920 x 1200 @ 60 Hz) support
- Digital Video Capture up to 165 MHz
- 1-bit Advanced Color Management (ACM-3D) and Adaptive Contrast Control (ACC)
- Text overlay via Serial Port or Ethernet
- Full command of all OSD functions through Serial Comm port or Ethernet.

Other video formats can be supported by customized firmware. Contact your Sales Engineer for details.

720 x 400 @ 70 Hz	Digital Separate Sync		720 x 400 @ 70 Hz	Sync on Green
640 x 480 @ 60 Hz	Digital Separate Sync		640 x 480 @ 60 Hz	Sync on Green
640 x 480 @ 60Hz	Composite Sync			
640 x 480 @ 72 Hz	Digital Separate Sync		640 x 480 @ 72 Hz	Sync on Green
640 x 480 @ 72Hz	Composite Sync			
640 x 480 @ 75 Hz	Digital Separate Sync		640 x 480 @ 75 Hz	Sync on Green
640 x 480 @ 75Hz	Composite Sync			
800 x 600 @ 56 Hz	Digital Separate Sync		800 x 600 @ 56 Hz	Sync on Green
800 x 600 @ 56 Hz	Composite Sync			
800 x 600 @ 60 Hz	Digital Separate Sync		800 x 600 @ 60 Hz	Sync on Green
800 x 600 @ 60 Hz	Composite Sync			
800 x 600 @ 72 Hz	Digital Separate Sync		800 x 600 @ 72 Hz	Sync on Green
800 x 600 @ 72 Hz	Composite Sync			
800 x 600 @ 75 Hz	Digital Separate Sync		800 x 600 @ 75 Hz	Sync on Green
800 x 600 @ 75 Hz	Composite Sync			
1024 x 768 @ 60 Hz	Digital Separate Sync		1024 x 768 @ 60 Hz	Sync on Green
1024 x 768 @ 60 Hz	Composite Sync			
1024 x 768 @ 70 Hz	Digital Separate Sync		1024 x 768 @ 70 Hz	Sync on Green
1024 x 768 @ 70 Hz	Composite Sync			
1024 x 768 @ 75 Hz	Digital Separate Sync		1024 x 768 @ 75 Hz	Sync on Green
1024 x 768 @ 75 Hz	Composite Sync			
1280 x 1024 @ 60 Hz	Digital Separate Sync		1280 x 1024 @ 60 Hz	Sync on Green
1280 x 1024 @ 60 Hz	Composite Sync			
1280 x 1024 @ 75 Hz	Digital Separate Sync		1280 x 1024 @ 75 Hz	Sync on Green
1280 x 1024 @ 75 Hz	Composite Sync			
1600 x 1200 @ 60 Hz	Digital Separate Sync		1600 x 1200 @ 60 Hz	Sync on Green
1600 x 1200 @ 60 Hz	Composite Sync			
1920 x 1080 @ 60 Hz	Digital Separate Sync		1920 x 1080 @ 60 Hz	Sync on Green
1920 x 1080 @ 60 Hz	Composite Sync			
1920 x 1200 @ 60 Hz	Digital Separate Sync		1920 x 1200 @ 60 Hz	Sync on Green
1920 x 1200 @ 60 Hz	Composite Sync			
720 x 480i	NTSC			
720 x 480i720 x 480i	NTSC 4.43, NTSC			
720 x 576i	PAL			
720 x 576i720 x 576i	PAL M PAL			
720 x 576i720 x 576i				
720 x 576i	SECAMPAL M			
720 x 576i				
720 x 576i	SECAM			

Table 2 – Supported Video Resolutions

Photo 1 - Front View

Photo 2 - Front Closed View

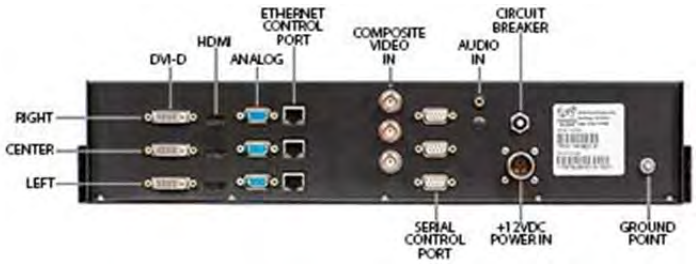


Photo 3 - Rear I/O View

Photo 4 - Rear Connector Callout

Photo 5 - Rear View Open

Note

The included cable management arm and rear mounting brackets on the slides are not shown.

Specifications

ENCLOSURE

2U (3.49") x 24.0" deep
Front Panel 1.4-inch 5052-H32 aluminum alloy
Body made of 5052-H32 aluminum alloy
All stainless steel hardware
All self-locking pressed in fasteners where appropriate
Powder coat black, medium texture, for ruggedness Other colors optionally available
Designed to Mil-Spec Standards to Satisfy Military, Industrial and Commercial Requirements
Compact Enclosure for Limited Depth Installation
Weight: 38lbs

19" DISPLAY

Standard Temperature / Brightness

19" TFT LCD 1280x1024, LED Backlight
Surface Treatment : Anti-glare hard coat
Display Colors: 16.7 Million
Response Time: 5mS typical
Viewing Angle: 85° horizontal, 80° vertical typical
Contrast Ratio: 1000:1 typical
Brightness: 350cd/m2 typical
Pixel Pitch: 0.294mm x 0.294mm
Pixel Arrangement: R.G.B Stripe
Power Management: EPA Energy Star, VESA DPMS
Operating Temperature: 0 to + 50°C
Storage Temperature: -20 to +60° C

High Temperature / High Bright

19" TFT LCD 1280x1024, LED Backlight
Surface Treatment : Anti glare hard coat
Display Colors: 16.7 Million
Response Time: 12mS typical
Viewing Angle: 80° typical
Contrast Ratio: 800:1 typical
Brightness: 1500cd/m2 typical
Pixel Pitch: 0.294mm x 0.294mm
Pixel Arrangement: R.G.B Stripe
Power Management: EPA Energy Star, VESA DPMS
Operating Temperature: -20 to + 70° C
Storage Temperature: -20 to +70° C

DISPLAY ENHANCEMENT OPTIONS

Optional Oleophobic Anti-Reflective (AR) coated glass bonded with optically clear index matched adhesive
ITO EMI Shield

OPTIONAL FEATURES / OPTIONS

Customer Specified Paint Color
Customer Logo
Custom sheet metal and mechanical features

AUDIO AMPLIFIER

Input Impedance: 6.8ohm
Output Power: 2.0W into 4Ω
Distortion: <2%
Gain: 0 to 21dB

SPEAKERS

22 x 33mm Cone
Input Power: 2W
Cone treated for water resistance

POWER SUPPLY OPTIONS

DC 12 Volt Input

Connector kit to assemble a custom cable

AC Input

90 to 260VAC, auto selecting
47-63 HZ

MIL-STD-704/1275A DC/DC Converter

True compliance for military 28VDC nominal vehicle inputs
18 to 36VDC input

See the appropriate power supply section for complete power supply specifications.

Chassis Rear Power Connectors

Certain models of Chassis Plans rugged computer chassis offer a 12VDC output port on the rear panel capable of driving the TFX1-19 without the use of an external power supply. This lowers system cost and complexity.

Note

The TFX1-192 High Bright panels require up to 200W of +12VDC and the user should assure the chassis power supply is adequately rated for total system load.

Table 3 – Specifications

LCD DVI/HDMI/VGA Input Features:

Harsh Environment LCD Controller

Inputs:

Analog RGB:	75Hz at SXGA, WXGA, XGA, SVGA, VGA With auto detect of Digital Separate Sync, Sync-On-Green & Composite Sync. Auto detects VGA ~WUXGA interlaced & noninterlaced.
DVI-D/HDMI:	60Hz at WUXGA 75Hz at SXGA, WXGA, XGA, SVGA, VGA
Video:	Composite (BNC)
Image Scaling:	Up / down scaling to fit input to panel resolution.
Image Control:	Brightness, Contrast, Saturation, Hue, Frequency, Phase, Color temperature, Image position, Hue, Gamma.
Other Features:	System information, OSD position, Scaling to fill screen and fill to aspect ratio, OSD timeout, Factory reset, OSD menu transparency, Picture In Picture – Variable position with 18 sizes selection and Picture By Picture, Programmable hot keys

Controller Feature Summary

- Brightness – LCD
- Brightness – Backlight
- Contrast
- Saturation & Hue
- Sharpness
- Blue only, Red only, Green only
- Monochrome Mode
- Auto Color Gain
- Gamma Curve Control
- Color Temperature
- Picture-in-Picture
- Auto Source Seek
- Auto Picture Setup
- Wide Screen Mode Detection
- Manual Clock / Phase / Position
- De-Interlacing Mode
- Auto Power
- Up- and Down-Scaling
- Image Orientation / Flip
- Freeze Frame
- Zoom / Pan
- OSD Position / Transparency
- Audio Volume
- Programmable Default Settings
- OEM Protected Setup Areas
- Power Up Configuration
- BIOS Upgrade Via RS-232
- White Balance
- Real Time Clock
- RS-232 Text Overlay

Table 4 –Video Controller Specifications

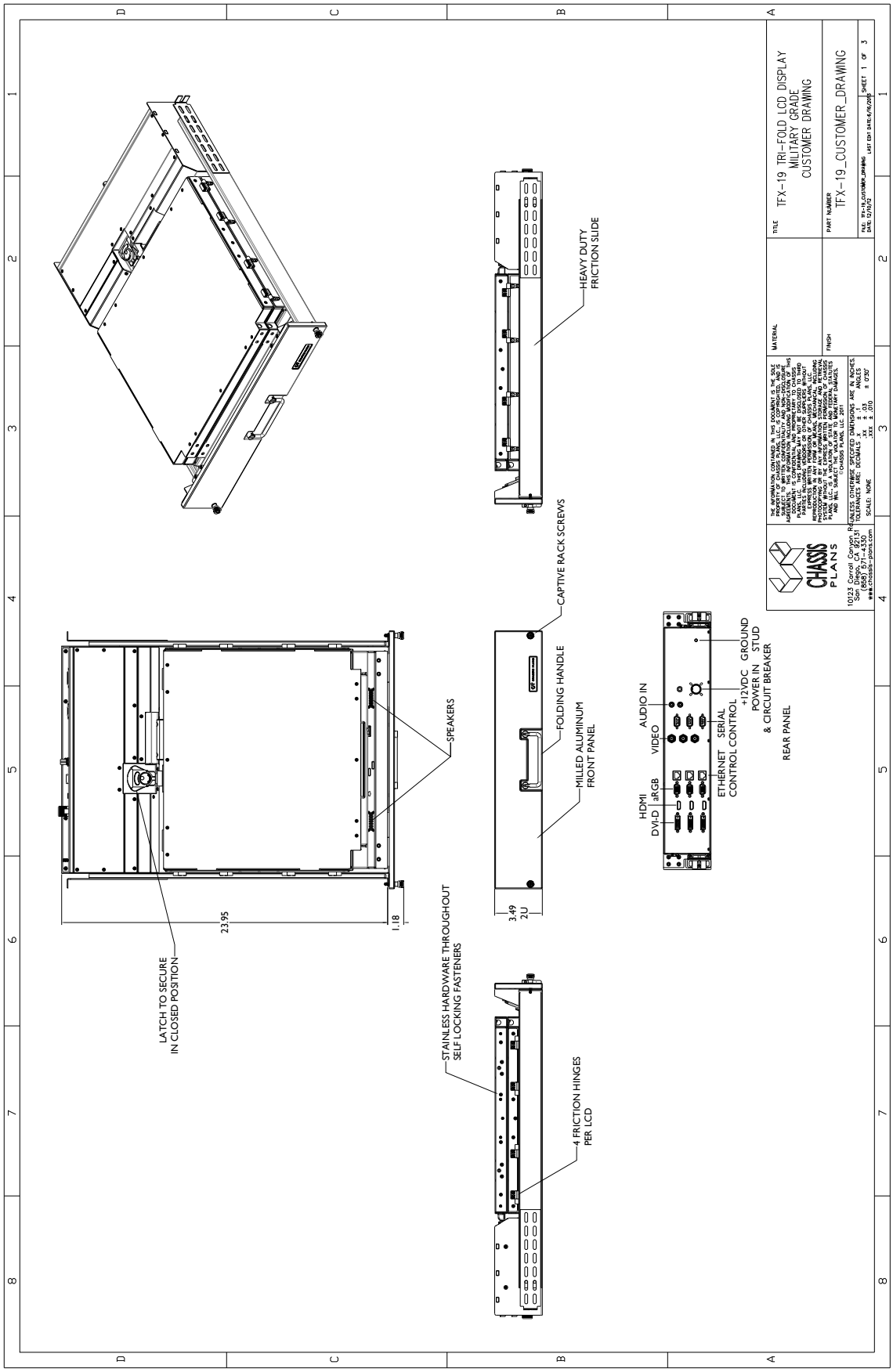


Figure 1 – TFX1-19 Customer Drawing Closed

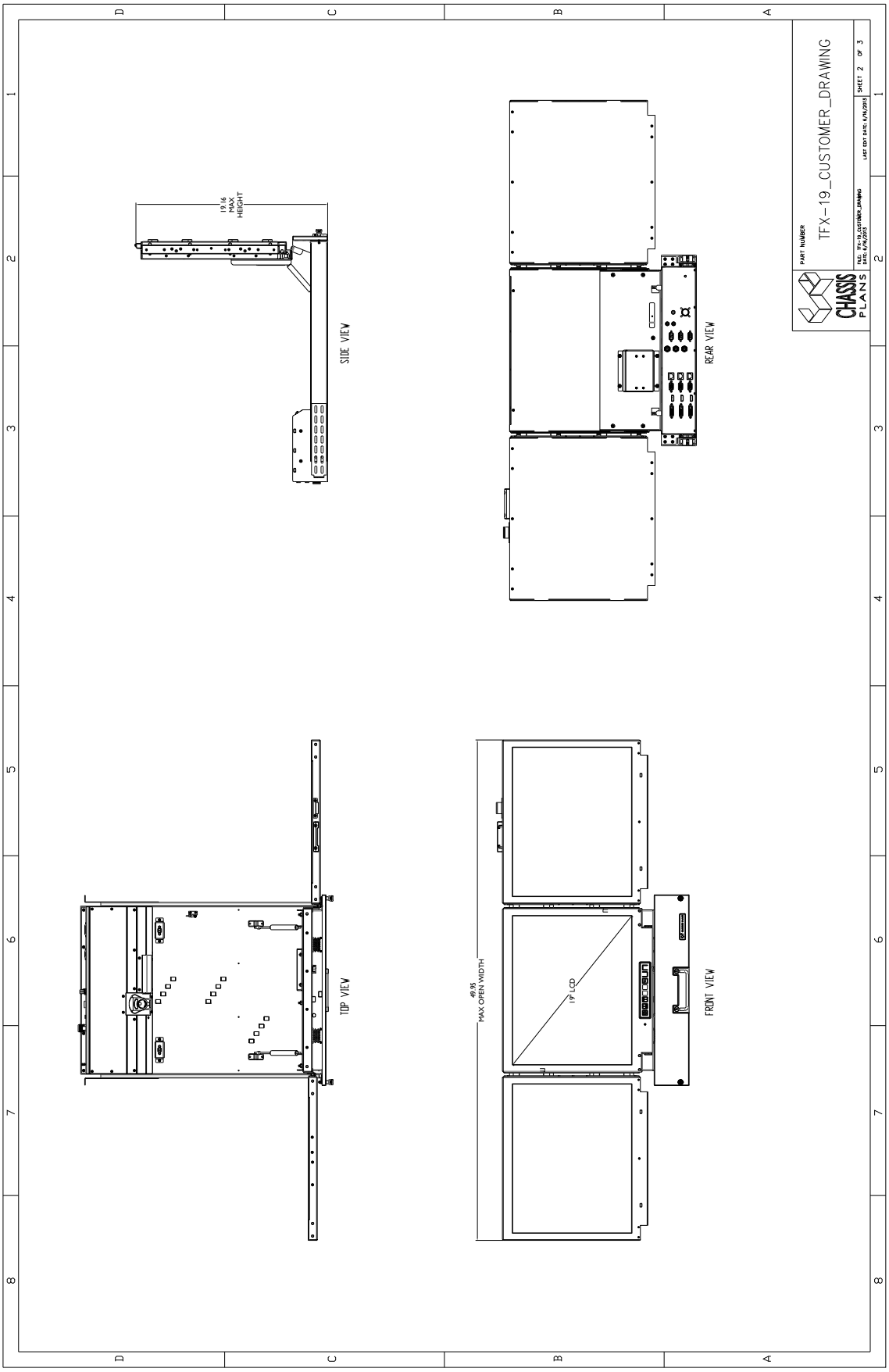


Figure 2 – TFX1-19 Customer Drawing Open

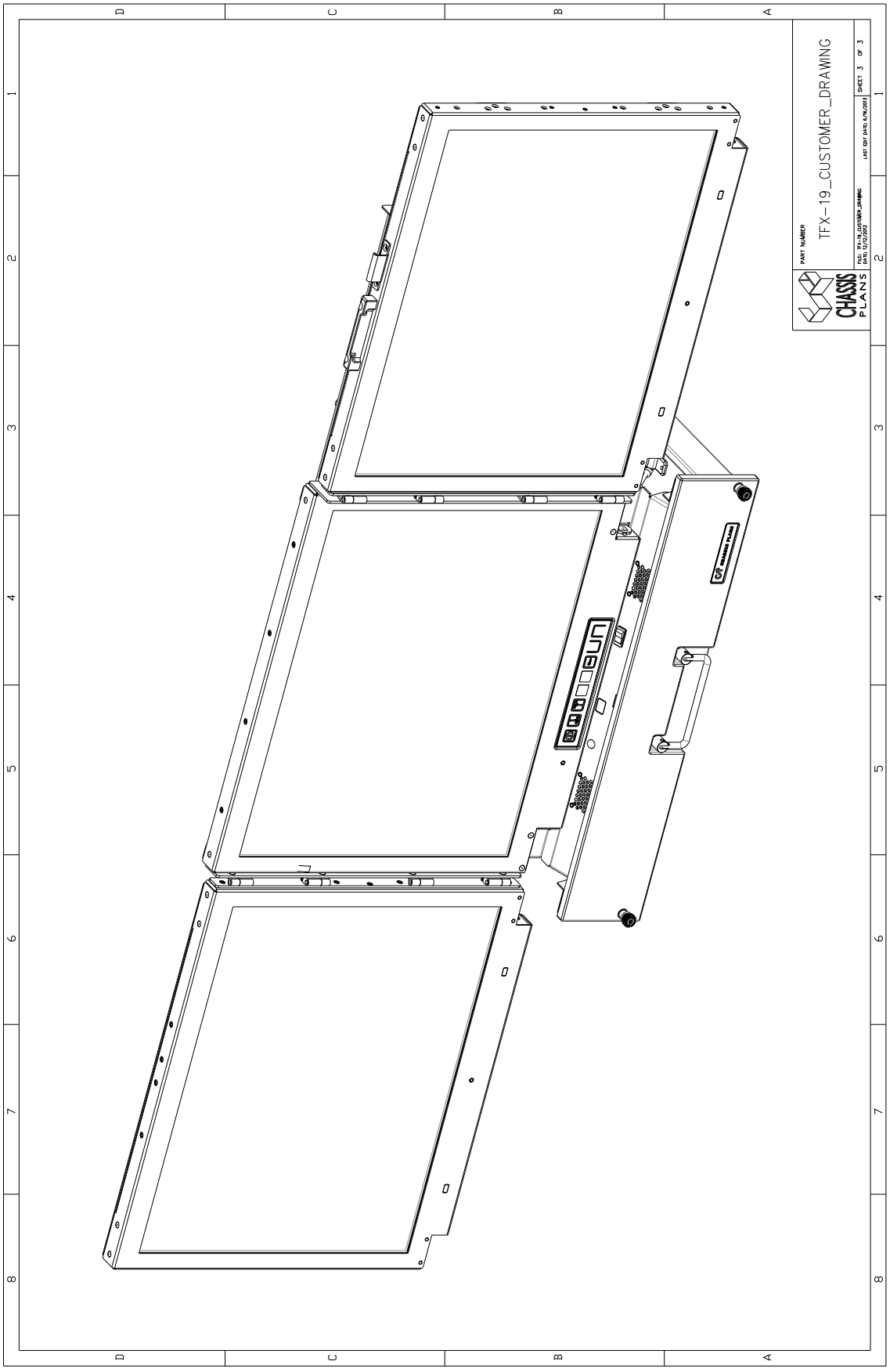


Figure 3 – TFX1-19 Customer Drawing Oblique View

Optional LCD Enhancements

In the TFX1-19 rugged military grade LCD displays, Chassis Plans starts with Grade A Industrial Quality LCD panels selected for optical performance, high reliability and long product life cycle. Optional, in order to not only ruggedize the LCD, but to also enhance the mechanical, optical and EMI properties of the finished unit, Chassis Plans optically bonds a layer of glass to the front of the LCD panel which is coated with an oleophobic Anti-Reflective (AR) coating. The adhesive is optically clear and refractive index matched to eliminate interface reflections.

An additional option provides for a conductive ITO coating to be applied to the back of the AR glass to provide superior EMI shielding. An additional option is available to embed a micro mesh screen in the AR glass adhesive. See Figure 3 for attenuation values. The Micro Mesh provides >50dB of shielding (30 MHz – 1 GHz) with 90% visible light transmission and zero Moiré fringing.

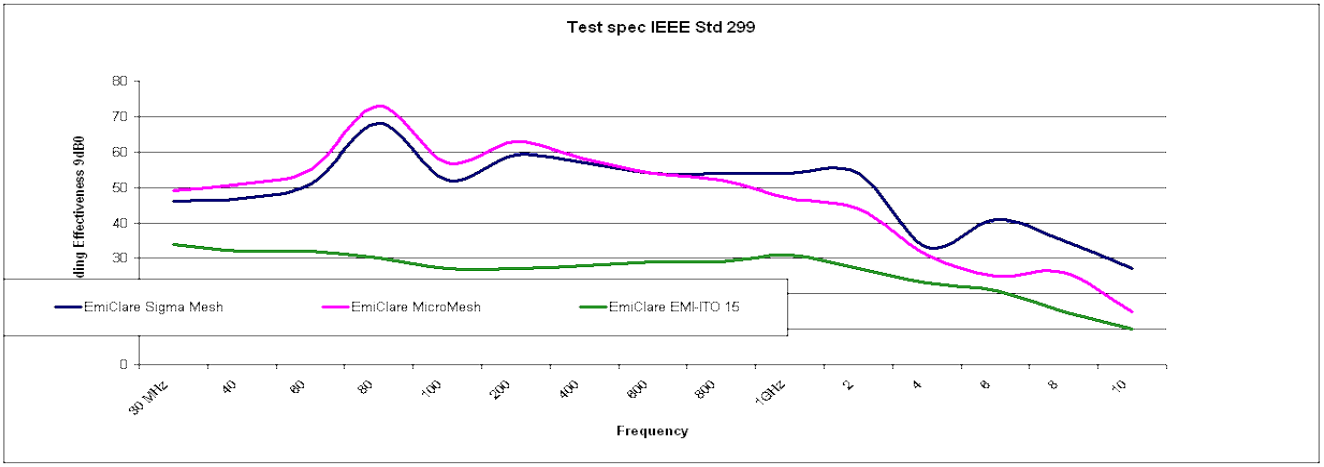


Figure 4 – EMI Shielding Effectiveness of MicroMesh EMI Filter

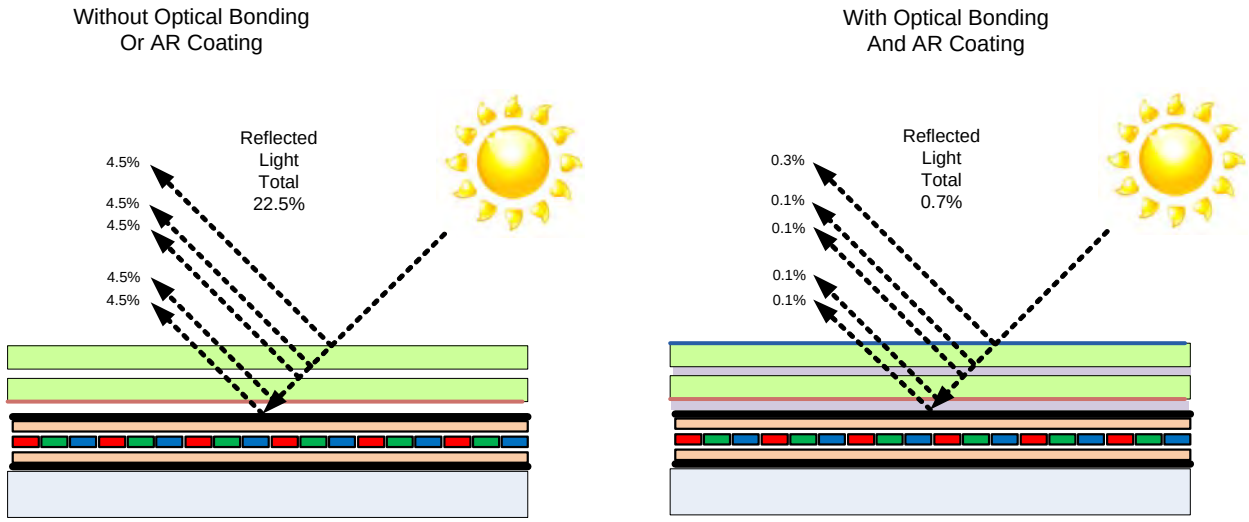


Figure 5 – Comparison of Reflections with and without Optical Bonding

The resulting structure has greatly enhanced optical characteristics in high ambient light conditions. The optical adhesive used is a silicone RTV and offers other benefits mechanically to the LCD as well. The adhesive remains pliable and therefore acts as a shock absorbing medium for the front of the LCD. Together with the additional layer of glass provides a very rugged composite structure. Another benefit is that should breakage actually occur the shards of glass will be retained together to prevent injury to personnel. The adhesive also prevents any condensation from building up in the air gap between the layers of glass which would cause

fogging of the display. Finally, the added mass bonded to the front of the LCD display adds a thermal conduction path to help dissipate the heat generated in the backlights themselves.

By eliminating the majority of reflected light, the apparent contrast improves making the display more legible in high bright situations.

Photo Courtesy of
GDS Clearview

Figure 6 **– Comparison with and without Optical Bonding**

Durable Anti-Reflection Oleophobic Coating (DARO)

Key Features

- Repels fingerprints
- Easy to clean with a soft cloth
- More than 450,000-rub resistant
- Chemically-inert coating resists stains
- Smooth surface minimizes abrasion and friction
- Water contact angle >110°
- Withstands more than 90 days of salt-fog exposure
- Less than 0.4 percent photopic brightness
- Soft blue hue in reflection
- 8H pencil hardness

Offering an AR coating on the TFX1-19 display greatly improves the user experience. The oleophobic coating stands up to hundreds of thousands of finger touches and rubs.

DARO coating is a breakthrough for touch applications. The coating nanostructure forms multiple, covalent bonds to provide outstanding durability.

DARO coatings offer superior optical performance by using multilayer anti-reflective coatings. The photopic brightness of the DARO coating is less than 0.5%, compared to the industry-standard bare glass at 4.25%. DARO coatings offer significant anti-reflection and clear viewing, especially in high-brightness environments.

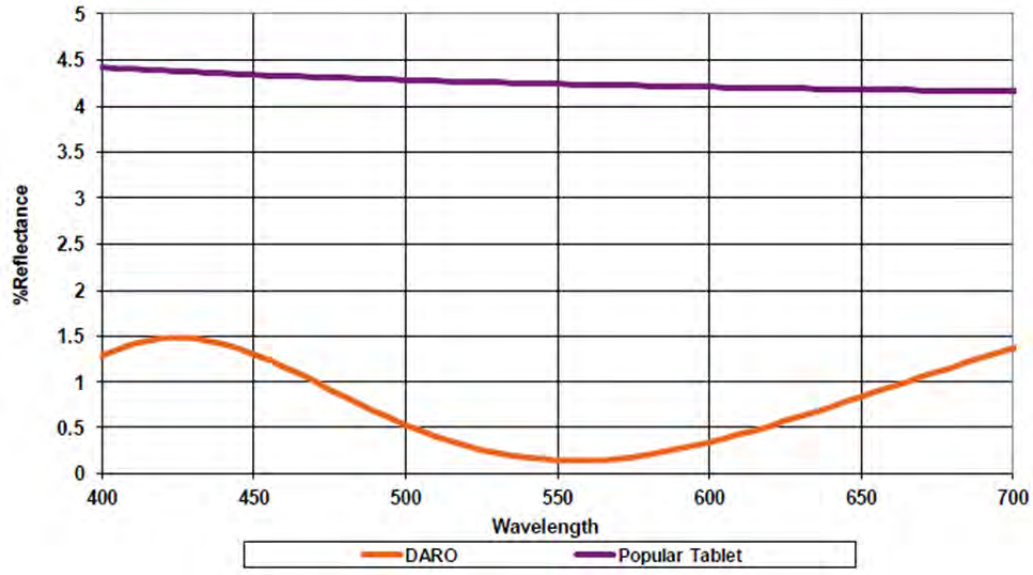


Figure 7 **– Comparison with and without Optical Bonding**

Specifications

Dry cheesecloth rub test with 1.5 lbs. weight	450,000 rubs
Steel wool #0000 with 1.5 lbs. weight	10,000 rubs
UV exposure, noon Florida sun, 24/7	500 hours
Salt fog, 5% NaCI at 35da	90 days
Copper accelerated acid spray test	30 days
Photopic reflection	<0.4%

Chapter 2 – Power Supply Options

The TFX1-19 displays offer a variety of power supply options to allow use in a diverse set of environments.

All the power supplies are mounted separately from the display and include a mounting bracket and hardware to allow mounting in the rear of the rack.

The TFX1-19 is offered with two display panel options with different power requirements. As such, there are different power supply options for the two different displays.

TFX1-191 Standard temperature range, 350nit brightness
The input power for the TFX1-191 is nominally 93 Watts.

TFX1-192 Wide temperature range, 1500nit brightness "High Bright"
The input power for the TFX1-192 is nominally 165 Watts.

Input Power
The input power to the display is nominally 12VDC at 8A for the TFX1-191 and 14A for the TFX1-192.

The "B" option in the ordering guide is for a standard +12VDC input as supplied by the user. Chassis Plans supplies a mating connector and pins kit to allow the user to create their own power cord.

Please note the 12VDC into the TFX1-191 should be regulated "clean" power with a tolerance of +/-5%. Power from vehicles is typically very "dirty" with large droops and transients such as generated when starting the vehicle. A front end filter is necessary to assure reliable operation of the TFX1-19 displays in this environment. Unfiltered power has the potential to damage the display. This is not covered under warranty.

Chassis Rear Power Connectors

Certain models of Chassis Plans' rugged computer chassis offer a 12VDC output port on the rear panel capable of driving the TFX1-19 without the use of an external power supply. This lowers system cost and complexity.

Chassis Plans offers this cable as Option G. Please see the ordering guide.

Note

The TFX1-192 High Bright panels require up to 200W of +12VDC and the user should assure the chassis power supply is adequately rated for total system load.

AC Input Power Supply – Standard Power

The AC Input Power Supply is a 150 W Medical Grade “Brick” style power supply. The output is provided with a circular mil connector for connecting to the LCD Display. The input accepts a standard IEC 320 plug. A bracket is provided to securely mount the supply in a rack.

The ordering number for this supply is ‘A’. See the Ordering Guide.

Alternate AC supplies are available as required by the application or environmental requirements.

INPUT		**ENVIRONMENTAL**	
Voltage	85-264 VAC	Operating Temperature	0 to 50°C
Current	1.4 A @ 110 VAC	Storage Temperature	-40 to +85°C
Frequency	47 – 63 Hz		
Input Connector	3-Pin IEC 320 Receptacle	**SAFETY**	
		cTUVus	
OUTPUT		UL 60950-1	
Voltage	12VDC	CAN/CSA-C22.2 No. 60950-1	
Max Current	12.5A	CB per IEC 60950-1	
Total Regulation	< +/- 5%	CE marked to LVD & EMC Directive	
Set Point Accuracy	< +/- 3% @ 60% Load		
Hold-up Time	>12mS @ Full Load, 115VAC	**EMI/EMC**	
Over Voltage Protection	Built-in	Emissions	CISPR22 and FCC Class B
Over Current Protection	Built-in	Immunity	EN6100-3-2, -3; EN61000-4-2, -3, -4, -5, -6, -8, -11
Short Circuit Protection	Pulsing mode, auto recovery		
SIZE			
L X W X H	7.56” x 2.45”” x 1.52”		
Weight	1.55 lbs		

Table 5 - AC Input Supply Specifications

Photo 6 - AC Power Supply (150W)

AC Input Power Supply – High Power for TFX1-192 High Bright Panel

The AC Input Power Supply is a 150 W Medical Grade "Brick" style power supply. The output is provided with a circular mil connector for connecting to the LCD Display. The input accepts a standard IEC 320 plug. A bracket is provided to securely mount the supply in a rack.

The ordering number for this supply is 'E'. See the Ordering Guide.

Alternate AC supplies are available as required by the application or environmental requirements.

INPUT		**ENVIRONMENTAL**	
Voltage	85-264 VAC	Operating Temperature	0 to 50°C
Current	1.4 A @ 110 VAC	Storage Temperature	-40 to +85°C
Frequency	47 – 63 Hz		
Input Connector	3-Pin IEC 320 Receptacle	**SAFETY**	
		cTUVus	
OUTPUT		UL 60950-1	
Voltage	12VDC	CAN/CSA-C22.2 No. 60950-1	
Max Current	TBD	CB per IEC 60950-1	
Total Regulation	< +/- 5%	CE marked to LVD & EMC Directive	
Set Point Accuracy	< +/- 3% @ 60% Load		
Hold-up Time	>12mS @ Full Load, 115VAC	**EMI/EMC**	
Over Voltage Protection	Built-in	Emissions	CISPR22 and FCC Class B
Over Current Protection	Built-in	Immunity	EN6100-3-2, -3; EN61000-4-2, -3, -4, -5, -6, -8, -11
Short Circuit Protection	Pulsing mode, auto recovery		
SIZE			
L X W X H	TBD		
Weight	TBD		

Table 6 - AC Input Supply (High Power) Specifications

Photo Coming

Photo 7 - AC Power Supply (200W)

MIL-STD-704/1275 DC Input Converter – Standard Power

The Mil-Std-704/1275 DC Input Converter provides true 704/1275 input specifications allowing reliable operation from nominal 28VDC input mains in a military environment. A Mil grade DC to DC Converter is provided in a rack mountable case with military grade circular connectors.

The ordering number for this supply is 'C'. See the Ordering Guide.

Operating Specifications	
Input Voltage	18-36VDC
Output Voltage	12.0VDC
Output Current	8A
Output Power	100 W
Electrical Specifications	
Efficiency	81%
Isolation	200VDC, Input to Output and Input to Case
EMI Filtering	Mil-Std-461E, CD101 and CE102 on the input
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Connectors	
Input Connector	TBD
Mating Input Connector	TBD
Pinouts	TBD

Environmental Specifications	
Pressure-Altitude	Per MIL-STD-810F, Method 500.4, Procedure I and II
High Temperature	Per MIL-STD-810F, Method 501.4, Procedure I and II
Low Temperature	Per MIL-STD-810F, Method 502.4, Procedure I
Humidity	Per MIL-STD-810F, Method 507.4, Procedure I
Fungus	Per Mil-Std-810F, Method 508.5, Procedure I
Salt Fog	Per Mil-Std-810F, Method 509.4, Procedure I
Sand and Dust	Per Mil-Std-810F, Method 510.4, Procedure I and II
Acceleration	Per MIL-STD-810F, Method 513.5, Procedure I and II
Vibration	Per MIL-STD-810F, Method 514.5, Procedure I, Category 1, 4, 7 thru 14 and 16 thru 21
Shock	Per MIL-STD-810F, Method 516.5, Procedure I, IV

Table 7 - MIL-STD-704/1275A Power Supply Specifications

Photo Coming

Photo 8 - DC Power Supply (100W)

MIL-STD-704/1275 DC Input Converter – High Power

The Mil-Std-704/1275 DC Input Converter provides true 704/1275 input specifications allowing reliable operation from nominal 28VDC input mains in a military environment. A Mil grade DC to DC Converter is provided in a rack mountable case with military grade circular connectors.

The ordering number for this supply is 'F'. See the Ordering Guide.

Operating Specifications	
Input Voltage	18-36VDC
Output Voltage	12.0VDC
Output Current	19.2A
Output Power	200 W
Electrical Specifications	
Efficiency	81%
Isolation	200VDC, Input to Output and Input to Case
EMI Filtering	Mil-Std-461E, CD101 and CE102 on the input
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C

Connectors	
Input Connector	TBD
Mating Input Connector	TBD
Pinouts	TBD

Environmental Specifications	
Pressure-Altitude	Per MIL-STD-810F, Method 500.4, Procedure I and II
High Temperature	Per MIL-STD-810F, Method 501.4, Procedure I and II
Low Temperature	Per MIL-STD-810F, Method 502.4, Procedure I
Humidity	Per MIL-STD-810F, Method 507.4, Procedure I
Fungus	Per Mil-Std-810F, Method 508.5, Procedure I
Salt Fog	Per Mil-Std-810F, Method 509.4, Procedure I
Sand and Dust	Per Mil-Std-810F, Method 510.4, Procedure I and II
Acceleration	Per MIL-STD-810F, Method 513.5, Procedure I and II
Vibration	Per MIL-STD-810F, Method 514.5, Procedure I, Category 1, 4, 7 thru 14 and 16 thru 21
Shock	Per MIL-STD-810F, Method 516.5, Procedure I, IV

Table 8 - MIL-STD-704/1275A Power Supply (High Power) Specifications

Photo Coming

Photo 9 - DC Power Supply (200W)

Chassis Plans' Chassis-To-LCD Rear Panel LCD Power Connector

Certain models of Chassis Plans chassis offer a connector mounted on the rear panel which outputs +12VDC and is intended to power companion LCD panels. Use of this cable simplifies the rear clutter in a rack by eliminating the external power supply and associated cables. This is also a lower cost option.

The ordering number for this cable option is 'G'. See the Ordering Guide.

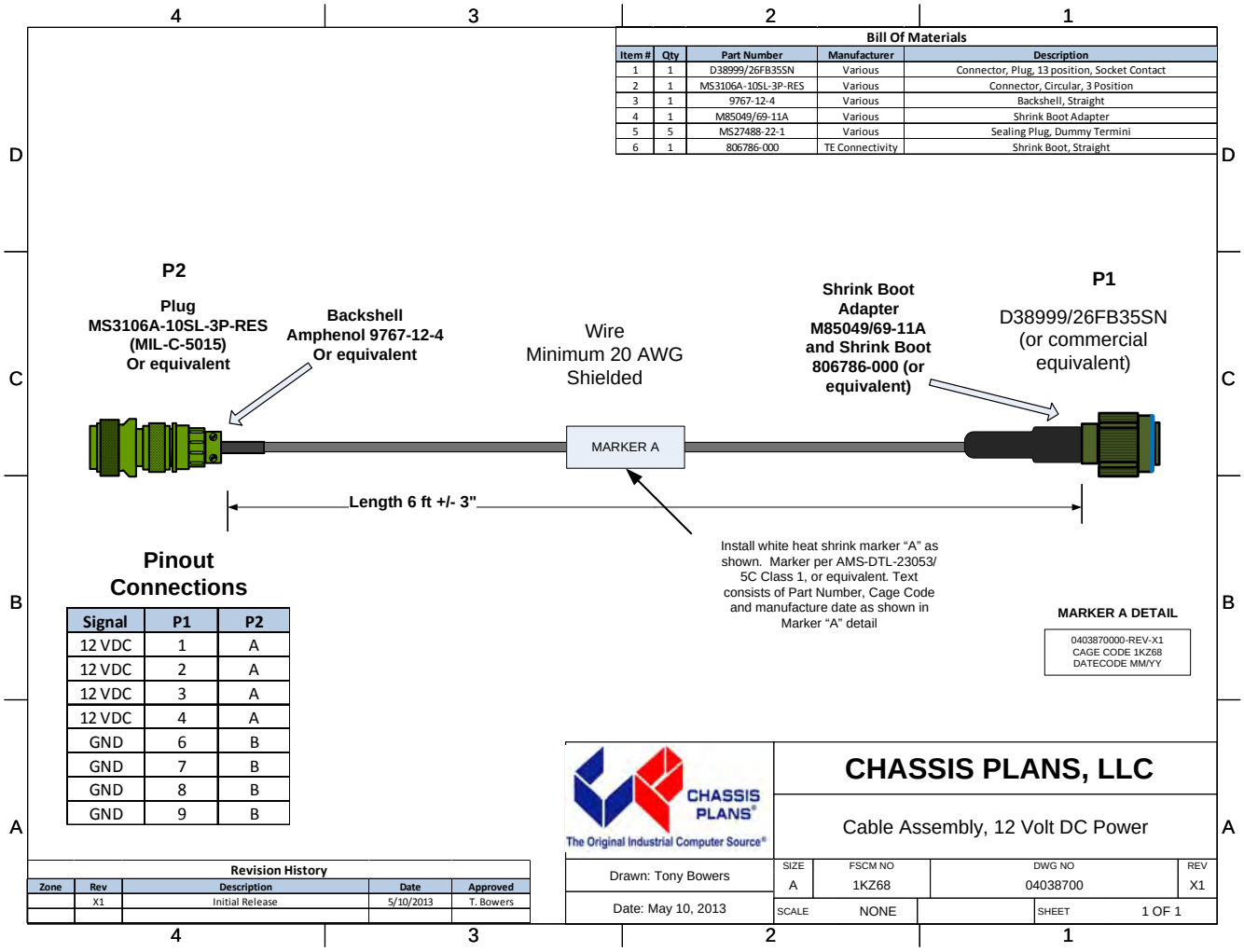

Bill Of Materials
Item # | Qty | Part Number | Manufacturer | Description
1 | 1 | D38999/26FB35SN | Various | Connector, Plug, 13 position, Socket Contact
2 | 1 | MS3106A-10SL-3P-RES | Various | Connector, Circular, 3 Position
3 | 1 | 9767-12-4 | Various | Backshell, Straight
4 | 1 | M85049/69-11A | Various | Shrink Boot Adapter
5 | 5 | MS27488-22-1 | Various | Sealing Plug, Dummy Termini
6 | 1 | 806786-000 | TE Connectivity | Shrink Boot, Straight
P2
Plug
MS3106A-10SL-3P-RES
(MIL-C-5015)
Or equivalent
Backshell
Amphenol 9767-12-4
Or equivalent
Wire
Minimum 20 AWG
Shielded
Shrink Boot
Adapter
M85049/69-11A
and Shrink Boot
806786-000 (or
equivalent)
P1
D38999/26FB35SN
(or commercial
equivalent)
MARKER A
Length 6 ft +/- 3"
Install white heat shrink marker "A" as shown. Marker per AMS-DTL-23053/5C Class 1, or equivalent. Text consists of Part Number, Cage Code and manufacture date as shown in Marker "A" detail
MARKER A DETAIL
0403870000-REV-X1
CAGE CODE 1KZ68
DATECODE MM/YY
Pinout Connections
Signal | P1 | P2
12 VDC | 1 | A
12 VDC | 2 | A
12 VDC | 3 | A
12 VDC | 4 | A
GND | 6 | B
GND | 7 | B
GND | 8 | B
GND | 9 | B
Revision History
Zone | Rev | Description | Date | Approved
X1 | Initial Release | 5/10/2013 | T. Bowers
CHASSIS PLANS
The Original Industrial Computer Source
CHASSIS PLANS, LLC
Cable Assembly, 12 Volt DC Power
Drawn: Tony Bowers
Date: May 10, 2013
SIZE A | FSCM NO 1KZ68 | DWG NO 04038700 | REV X1
SCALE NONE | SHEET 1 OF 1

Figure 8 – Direct Chassis to Display Power Cable

Chapter 3 – Ordering Information

LCD Panel Selection
TFX1-191 = Standard temperature range and brightness
TFX1-192 = Wide temperature range with high bright backlight

LCD Surface Treatment
A = AR coated cover glass with DARO oleophobic coating
B = Standard LCD anti-glare coating. No cover glass or AR coating
E = AR coated cover glass with DARO oleophobic coating and ITO EMI shield

Video Controller Option
D4 = Composite Video Input with VGA, DVI-D and HDMI inputs

Power Options
A = Universal AC 85-264VAC 47 – 63 Hz, 150W for TFX1-191 Standard Panel
B = 12VDC Connector Kit
C = MIL-STD-704 (28VDC Nominal), 100W for TFX1-191 Standard Panel
E = Universal AC 85-264VAC 47 – 63 Hz, 200W for TFX1-192 High Bright panels
F = MIL-STD-704 (28VDC Nominal), 200W for TFX1-192 High Bright panels
G = Direct Chassis-to-Display power cable

Example Part Number
TFX1-191AD4-A = TFX1-19, Standard Temperature Panels, Anti-Reflective Coated Bonded Glass with Daro Coating, No EMI Filter, AC Power.

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Chapter 4 - Package Contents

Part Description	Quanty
TFX1-19 LCD Display Assembly	1
Rack Slides, C-300-S Solid Bearing Friction Slides	1 pair
B-309 Extension Bracket (0 to 6.5” Extension)	1 pair
03161600A-0200 Extension Bracket (3 to 11” Extension)	1 pair
Slide Installation Kit	1 bag misc screws and backing plates
Power Supply	1 (if ordered)
Power Supply Rack Bracket	1 (part of optional power supply)
10-32 x 1” Pan Head Screws	8
Plastic Rack Washers	8
10-32 Cage Nuts	8
10-32 Nuts	8
Power Cord Kit – (Note 1)	1 (part of optional power supply)
Manual	1
Rack Ruler	1

Table 9 - Package Contents

Notes:

1. **Power Cord Kit** – For the AC input supplies, a standard 6-foot North American IEC-320 power cord is provided. For the DC input supplies, a kit is provided with a mating Mil Circular connector, backshell, and pins allowing the user to fabricate an appropriate cable for the intended application. For volume orders, Chassis Plans can provide pre-fabricated power cables per the end use specifications.

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Chapter 5 - Installation

Rack Installation

To mount the TFX1-19 in a rack, it is first important you identify the correct holes to mount to. Please see the following illustration. Note that a 'U' starts between the holes that are ½" apart. One very common problem is trying to install into the wrong holes.

Because there are multiple styles of racks, it is not possible to provide detailed instructions on mounting the equipment.

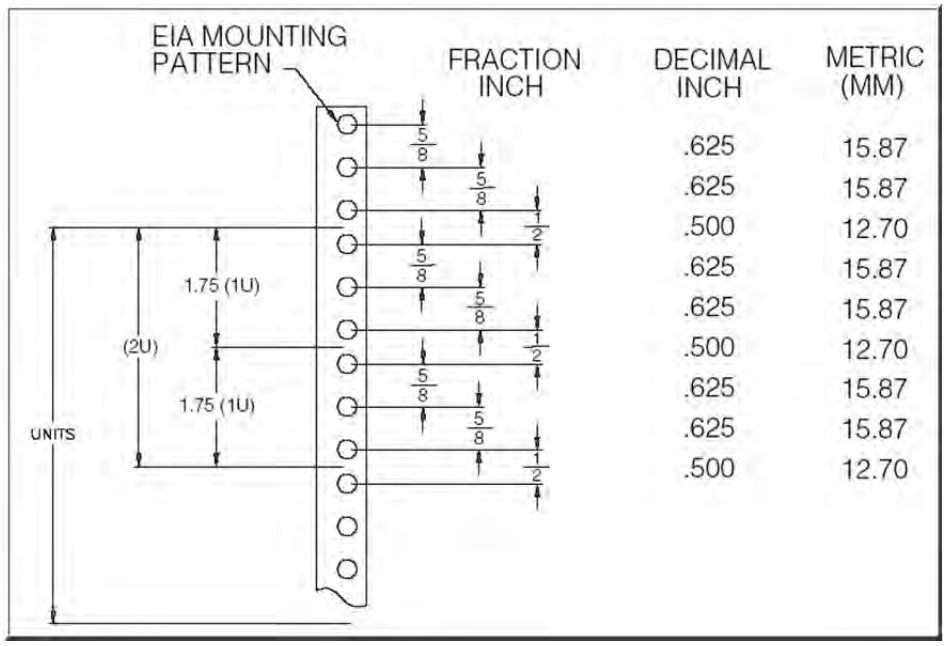

Figure 9 - Rack Mounting Hole Spacing

Chassis Plans offers free Rack Rulers to assist in installing equipment into racks. You should have received one with your order. To request more, fill out the short form at http://www.chassis-plans.com/form_rack_ruler.html and we'll send you as many as you want. These are invaluable for installing systems into racks.

Installing the TFX1-19

The TFX1-19 is intended to be supported in the rack using the front and rear mounting ears attached to the slides. Two rear slide adapter brackets which allow a length adjustment of 0 to 6.5" and 3 to 11" are provided with each TFX1-19.

Connecting the Display

The TFX1-19 provides for a single controller option with rear panel details provided below. Each LCD panel is provided with its own controller.

TFX1-19 Audio Connection

The TFX1-19 provides for a single channel of stereo audio input. The audio connector, J2, is located on the rear panel and is a standard 3.5 mm Mini Stereo Jack. The audio is connected to the **left** LCD panel controller which provides a 2-Watt amplifier. Control of the audio function is through the left panel On Screen Display (OSD). See the **Picture** section of the OSD menus in Chapter 6 following. The speakers are located below the middle panel on the front of the unit.

Note

The Front Panel LCD Control Selector Switch must be positioned to the ***left*** to access the left panel audio functions. The left panel controller is connected to the speakers.

Note

The Middle and Right controllers also have audio amplifiers but they are not connected. You can access the audio control functions in these controllers through the OSD for these panels but that will have no effect on the audio.

Rear Panel Connections

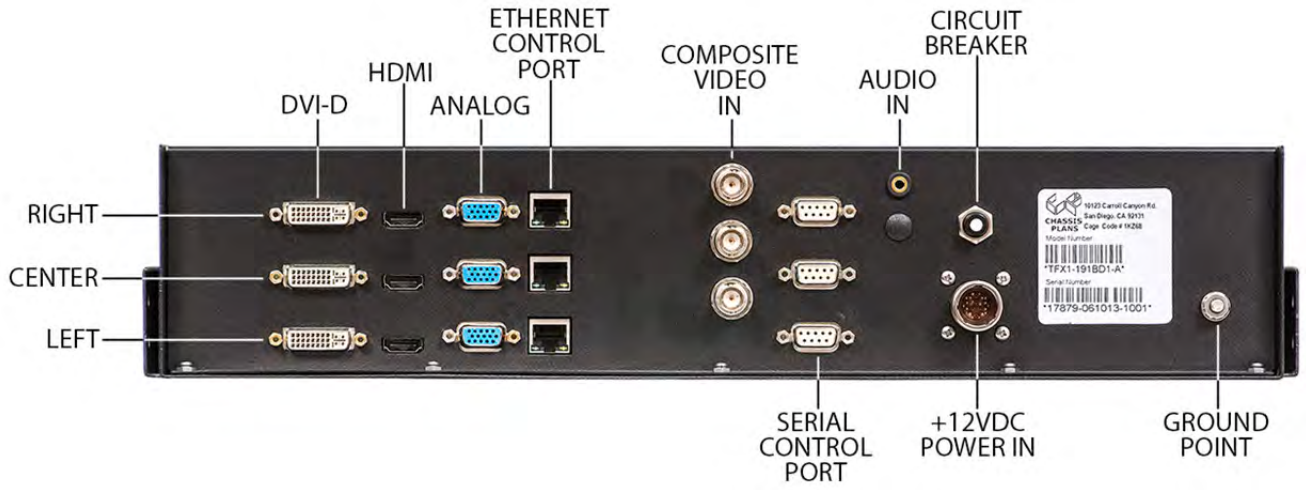

Photo 10 –TFX1-19 Bottom View and I/O

Table 8, following, details the connectors for the TFX1-19.

J#	Function	Connector	Notes
J1	Power Input	D38999/20FB35PN	
J2	Audio In	3.5 mm Mini Stereo Jack	On Left Controller
J3	RS-232 Command Port - Right	DE-9 D-Subminiature Female	
J4	RS-232 Command Port - Middle	DE-9 D-Subminiature Female	
J5	RS-232 Command Port - Left	DE-9 D-Subminiature Female	
J6	Composite Video - Right	75 Ω BNC Jack	
J7	Composite Video - Middle	75 Ω BNC Jack	
J8	Composite Video - Left	75 Ω BNC Jack	
J9	Ethernet Command Port - Right	RJ-45 Jack	
J10	Ethernet Command Port - Middle	RJ-45 Jack	
J11	Ethernet Command Port - Left	RJ-45 Jack	
J12	Analog Video Input - Right	HD-15 D-Subminiature	
J13	Analog Video Input - Middle	HD-15 D-Subminiature	
J14	Analog Video Input - Left	HD-15 D-Subminiature	
J15	HDMI Input - Right	HDMI	No Audio
J16	HDMI Input - Middle	HDMI	No Audio
J17	HDMI Input - Left	HDMI	No Audio
J18	DVI-D Input – Right	DVI-D	No Analog Video
J19	DVI-D Input – Middle	DVI-D	No Analog Video
J20	DVI-D Input - Left	DVI-D	No Analog Video

Table 10 - Rear Panel Connections

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Chapter 6 – LCD Operation

LCD Front Panel Controls

The LCD controls are mounted below the middle LCD panel.

Display Control Select Switch

Each of the three TFX1-19 LCDs is provided with its own controller. The Display Control Select Switch is used to connect the front panel OSD control panel to the appropriate controller. Position the switch to the left, middle, or right position to control the appropriate panel.

Status LED

Green	Normal Operation
Red	Power On but no input signal
Off	No power or display turned off

Photo 11 – Front Panel Controls

Backlight Inhibit Switch

A Backlight Inhibit Switch is provided to turn off the LCD backlights when the display is closed. This is an automatic function, not a user accessible switch.

On Screen Display (OSD)

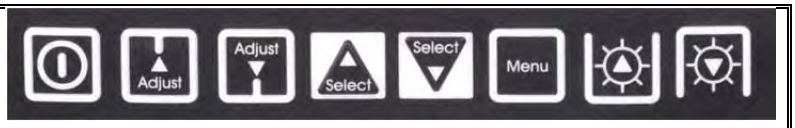
The On Screen Display (OSD) is adjusted as follows:

1. Position the Display Control Switch **Left**, **Middle**, or **Right** to adjust the associated display
2. Press the **Menu** Button located on the front of the monitor.
3. Use the buttons described below to maneuver around the Menu.
4. Select the desired OSD Menu from the Menu Screen Shots below to make the desired adjustment(s).
5. Press the **Menu** button to exit out of the OSD Menu when complete or wait for the OSD window to automatically close as set by the OSD Time Out setting.

- **Power:** Turns the Unit On and Off
- **Adjust ▲:**
  - o Hot Key 1 ***Increase***
  - o When the cursor is not showing in sub menus, moves selection ***right*** between top tabs.
  - o Cursor showing in sub menus, adjusts setting ***up***.
  - o Cursor on sub-sub menu (► showing), enters sub-sub menu. (See Select ▲ below to escape).
  - o Toggles ***Off*** to ***On***
- **Adjust ▼**:
  - o Hot Key 1 Decrease
  - o When the cursor is not showing in sub menus, moves selection ***left*** between top tabs.
  - o Cursor showing in sub menus, adjust setting ***down***
  - o Toggles ***On*** to ***Off***
- **Select ▲:**
  - o Hot Key 2 ***Increase***
  - o Moves the cursor ***up***.
  - o When in a sub-sub menu, repeatedly press to move to the previous menu level. (See Adjust ▲ above)
- **Select ▼:**
  - o Hot Key 2 ***Decrease.***
  - o Moves the cursor ***Down***.
- **Menu**
  - o Opens or closes the OSD menu
  - o See Note 1 below for additional information.
- **Brightness ▲:**
  - o ***Increases*** the screen brightness.
- **Brightness ▼:**
  - o ***Decreases*** the screen brightness.

LED: Green-Normal Operation

Green	Normal Operation
Red	Power On but no input signal
Off	No power or display turned off



Hot Keys
Hot Keys are defined in the Utility/Hot Key menu and allow single button access to the defined function.

Adjust ▲ and ▼ - Hot Key 1 Up and Down

Select ▲ and ▼ - Hot Key 2 Up and Down

Display Auto Adjust
Pressing **Auto/Exit** will perform a auto display adjustment when in aRGB mode. This automatically adjusts the Phase and Clock for the displayed image.

To save your changes, press the front panel **Menu** button. Alternatively, changes are saved if no buttons are pressed and the OSD times out returning back to the display.

Notes On the Menu Buttons –

1. The Menus are context sensitive in that only adjustments pertaining to the selected input will be displayed. For example, if DVI is selected for the input, then items such as Hue will not be adjustable.
2. Pressing the Menu button returns to the previously opened menu.

Notes on Hot Keys -

1. Hot Keys allow single button selection of a function.
2. Definition of the Hot Keys is set in the Utility menu. Thus, for example, if the Adjust keys are set up for Input Source, pushing the Up button rolls Up through the Input Sources and pushing the Down button rolls Down through the Input Sources.
3. The Hot Keys display in the upper left of the screen when pushed.

Note on Factory Default –

1. Under the Utilities Menu, a selection is available to return the board setting to the factory defaults.
2. Press and hold **Select ▼** then power on the controller.

Table 11 - Front Panel Controls

LCD Controller OSD Menus

OSD functions

Picture :

Volume### Increase/decrease volume level, total: 100 steps

Brightness Increase/decrease panel brightness level, total: 100 steps

Contrast Increase/decrease panel contrast level, total: 100 steps

Saturation Increase/decrease saturation, total: 100 steps

Hue ** Increase/decrease Hue level, total: 100 steps

Sharpness* Increase/decrease sharpness, total: 30 steps

Backlight Backlight brightness adjustment (Functions when light detector sets OFF)

Position##

Move the image position upward

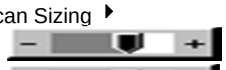
Move the image position downward

Move the image position to the left

Move the image position to the right

Aspect / Size ▸

- Fill Screen : Enable full screen expansion for lower resolution Image
- Fill to Aspect Ratio: Enable fill screen expansion for lower resolution image according to aspect ratio
- 4 : 3 : scaling format in 4:3
- 16 : 9 : scaling format in 16:9
- 16 : 10 : scaling format in 16:10
- 2.35 : 1 : scaling format in 2.35:1
- 2 : 1 : scaling format in 2:1
- 1 : 1 : Display the exact image resolution on the screen without image expansion.
- Custom Sizing* : (The name will change depends on the scaling mode selected.)
  - Overscan
  - Normal
  - Custom/Underscan Sizing ▸

H Size 

V Size

H Pan

V Pan

Blue Only

ON / OFF : Turn off the "Red" & "Green" channel (i.e. output all zero to Red & Green channel)
[This function will display on OSD menu when JP4 – 5-6 closed]

* : DISPLAY IN VIDEO MODE ONLY
** : FUNCTION IN ARGB/ DVI / VIDEO NTSC MODE ONLY
# : DISPLAY IN ARGB / DVI MODE ONLY
: FUNCTION IN ARGB MODE ONLY
: DISPLAY WHEN AUDIO ADD-ON BOARD CONNECTED

Source : Select the input video signal

Main Port Change ▸
VGA
DVI
HDMI+
HD/SD SDI 1++
HD/SD SDI 2++
Composite 1
Composite 2***
S-Video 1
S-Video 2***
Component 1
Component 2***

PIP Port change ▸
PIP Off / Composite 1 / S-Video 1 / Component 1 / DVI / HDMI+ / HD/SD SDI 1++ / HD/SD SDI 2++)

PIP Size ▸ : Off / PIP Size/ 1~18 / Size by Size / Size by Size Tall
The PIP capability on display input sources refer to Appendix E – PIP mix table

PIP Position :

Move the PIP position upward

Move the PIP position downward

Move the PIP position to the left

Move the PIP position to the right

PIP Blend Level : 6.25% ~ 100%
PIP Swap : Swap between the main window and PIP window

PIP Auto Turn off : : OFF / ON
ON : When PIP is no signal input after 30 seconds, the PIP window will turn off automatically.
OFF : PIP window keeps on
*** DISPLAY WHEN SETTING ON UNDER SETUP → AUTO SOURCE SEEK + FUNCTION DISABLE WHEN KIT 70600-3 CONNECTED
++ DISPLAY WHEN KIT 70600-3 CONNECTED

Utilities :

Setup ▸
Auto Picture Setup# : Auto adjust the image position, phase and size
Auto Color Gain# : Auto Color Calibration (See appendix IV)
Wide Screen Mode detection# ▸ : Recognize the wide screen mode coming from ARGB port
- Off
- 1280x768
- 1360x768
- 1366x768

Manual Clock# : Adjust the image horizontal size
Manual Phase# : Fine tune the data sampling position (adjust image quality)

Auto Source Seek :
- Auto : : OFF / ON
ON – Auto source select always enable
OFF – Disable auto source select function
- Setup ▸ Selection for the corresponding input sources detection

VGA
DVI
HDMI+
HD/SD SDI 1++
HD/SD SDI 2++
Composite 1
Composite 2
S-Video 1
S-Video 2
Component 1
Component 2

The corresponding input port name display on OSD menu will disappear once setting "OFF".

Auto Power : OFF / ON

ON – Enable soft power off function if absence of input signals
OFF – Disable soft power function

De-interlacing Mode* ▸

AFM : Auto Film Mode

TNR : Temporal Noise Reduction

MADI : Motion Adaptive De-interlacing

DCDi : Low Angled De-interlacing

[See Appendix VI for AFM, TNR, MADI, DCDi function description]

Video Wall Setup ▸

Video Wall

Video Wall Size : Choose the video wall size (Number of panel for horizontal [max 4] x Number of panel for vertical [max 4]).

Video Wall ID Setup : Set the matching ID number same as the ID number shown on screen. For details, please refer to the application note of the video wall setup.

Bezel Compensation ▸

Bezel Compensation

Active Area (H) (mm) : Type in the active area in horizontal with reference to the panel specification

Active Area (V) (mm) : Type in the active area in vertical with reference to the panel specification

Bezel Opening Area (H) (mm) : Type in the bezel opening area in horizontal with reference to the panel specification.

Bezel Opening Area (V) (mm) : Type in the bezel opening area in vertical with reference to the panel specification.

Enable RGB SOG: OFF / ON

Video Standard (SD)* : Auto / NTSC / NTSC 4.43 / PAL / PAL M / SECAM

Gamma : 0.6 / 0.7/ 0.8 / 1.0 / 1.6 / 1.8 / 1.9 / 2.0 / 2.1 / 2.2 / 2.3 / 2.4 / 2.5 / 2.6 / User Setting

OSD ▸

OSD position :

H POS : Move the OSD menu image horizontally

V POS : Move the OSD menu image vertically

OSD Timeout (sec) : ON – 60 : Adjust the OSD menu timeout period in a step of 5 seconds (max 60 seconds)
ON = Continuous to display OSD menu.
60 = 60 seconds later will turn off the OSD menu.

Screen Marker ▸

Screen Marker : On/Off
Center Marker : On/Off
Safe Area Enable : On/ Off
Aspect Marker Enable : On/Off
Safe Area Market : 80%~99%
Aspect Marker : 4:3 / 16:9
Transparency Level : 0% / 25% / 50% / 75% / 100%
Exit menu

Language : English / Spanish / French / German / Chinese :Select OSD menu language display

Transparency : OFF / ON : Set OSD transparency

Display Input : OFF / ON : Display input source info after switching source.

Real time clock ▸ show and edit the real time clock (This function is valid when “Display Input” sets ON.)

DATE : DD/MM/YYYY : Date/Month/Year
TIME : HH/MM/SS (AM/PM): Hour/Minute/Second
SETUP ▸
Month / Day / Year
Hour / Minute / AM/PM

Display Clock : Disable or enable to display the real time clock when display video source info after switching source.

Freeze : Freeze the image (use “+” button)

Zoom ▸

Zoom level : : Enable the zoom in function on the image displayed.
Use “+” button to zoom in the image
Use “-“ button to decrease the zoomed image

Horizontal pan : : Pan the image horizontally

Vertical pan : : Pan the image vertically
Factory Reset
Note : Freeze state will be cleared when you using zoom function.

Color Temperature
5000K
Red Gain :
Green Gain :
Blue Gain :
Red Offset :
Green Offset :
Blue Offset :
Reset to Defaults : Resume to the default values
6500K
Red Gain :
Green Gain :
Blue Gain :
Red Offset :
Green Offset :
Blue Offset :
Reset to Defaults : Resume to the default values
8000K
Red Gain :
Green Gain :
Blue Gain :
Red Offset :
Green Offset :
Blue Offset :
Reset to Defaults : Resume to the default values
9300K
Red Gain :
Green Gain :
Blue Gain :
Red Offset :
Green Offset :
Blue Offset :
Reset to Defaults : Resume to the default values

User setting :
Red Gain :
Green Gain :
Blue Gain :
Red Offset :
Green Offset :
Blue Offset :
Reset to Defaults : Resume to the default values

Reset All to Defaults : Resume all color temperature settings to the default values.

Hot Key
Hot key 1 : Volume / Brightness / Contrast / Inputs / Aspect Ratio/ Zoom / Freeze / PIP Size / PIP Swap / Saturation / Hue / Backlight / Auto Picture Setup / No Function

Hot key 2 : Volume / Brightness / Contrast / Inputs / Aspect Ratio / Zoom / Freeze / PIP Size / PIP Swap / Saturation / Hue / Backlight / Auto Picture Setup / No Function

Monochrome Mode
- Color

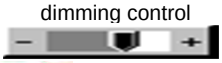
	- Red Monochrome - Green Monochrome - Blue Monochrome - Red Only - Green Only - Blue Only **Backlight Setup** ▸ - B/L Invert : : Invert for the backlight brightness - B/L Control : D/A / PWM : Selection for voltage level dimming control / PWM dimming control - Backlight Frequency :  100 ~ 440Hz in a step of 20 - Light Detector : : Enable ambient light detector function by using KIT 70220-3 **Default Setting** ▸ Reset to Factory Defaults ▸ (Activate when JC1 position 4 sets open) Are you sure ? Yes/No Reset to Factory Defaults with (Color Temp.) ▸ (Activate when JC1 position 4 sets open) Are you sure ? Yes/No Save Current Settings as Calibrated Values ▸ (Activate when JC1 position 2 sets closed) Are you sure ? Yes/No Recall Stored Calibrated Values ▸ Are you sure ? Yes/No * : DISPLAY IN VIDEO MODE ONLY # : DISPLAY IN ARGB MODE ONLY + FUNCTION DISABLE WHEN KIT 70600-3 CONNECTED ++ DISPLAY WHEN KIT 70600-3 CONNECTED Firmware V0.45.00.01 or up

Table 12 - LCD Controller OSD Menus

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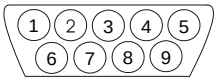
Appendix A – Display Serial Control Programming

The LCD provides for remote serial RS232 or Ethernet control for the LCD through the rear panel Control Port as shown below.

RS-232 Serial Control

Baud rate **2400, 8 bits, 1 stop bit and no parity**



Mating face of
RS-232 DB9 Male

PIN#	Description
2	RS-232 Rx Data
3	RS-232 Tx Data
5	Ground

Mating connector : DB9 Female

Ethernet Control

Please see Appendix F for information regarding Ethernet Control of the panel. The following command set remains the same for Ethernet control as compared to Serial control.

LCD Controller Serial/Ethernet Control Functions

The OSD functions are controlled through the following RS-232 commands.

The RS-232 program can be custom-tailored to fit the application or it can be used as provided by Chassis Plans on request. Please contact Chassis Plans for additional information.

Function	Command	Description	Remark
Menu button	0xf7	Menu button pressed	Button equivalent
Select-down button	0xfa	Select-down button pressed	Button equivalent
Select-up button	0xfb	Select-up button pressed	Button equivalent
Right/+ button	0xfc	Right/+ button pressed	Button equivalent
Left/- button	0xfd	Left/- button pressed	Button equivalent

Table A-1 - Commands to Implement Switch Mount Control Buttons

Function	Command	Description	Acknowledge (if enabled)
Volume control - left+right channel	0x80, “a” | “A”, nn | “+” | “-” | “r” | “R” | “?”	Set audio (L+R) volume = value/increment/decrement Reset Query	volume Range : “0””0”-“1””E” Default : “0””F”
Volume control - on/off (mute)	0x80, “m” | “M”, “0” | “1” | “r” | “R” | “?”	 Disable audio output. Enable audio output. Reset Query	“0” - audio off (muted). “1” - audio on.
Brightness control	0x81, nn | “+” | “-” | “r” | “R” | “?” “m” “n” “i” , ss, nn “o”, ss,	Set brightness = value/increment/decrement Reset Query Current Source Maximum query *1 Minimum query *1 Set, Source, value *1 Query, Source *1	Brightness. Range : “4””E”-“B””2” Default : “8””0” ss - reference by Input main select(0x98)
Contrast control - all channels	0x82, “a” | “A”, nn | “+” | “-” | “r” | “R” | “?” “m” “n” “i ” , ss, nn “o”, ss,	Set all contrast = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, value *1 Query, Source *1	Contrast Range : “1””C”-“E””4” Default : “8””0” ss - reference by Input main select(0x98)
Saturation control	0x83, nn | “+” | “-” | “r” | “R” | “?” “m” “n” “i” , ss, nn “o”, ss,	Set color = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, value *1 Query, Source *1	PAL/NTSC color (In video mode only) Range : “0””1”-“F””F” Default : “8””0” ss - reference by Input main select(0x98)
Hue control	0x84, nn | “+” | “-” | “r” | “R” | “?” “m” “n” “i” , ss, nn “o”, ss,	Set tint = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, value *1 Query, Source *1	NTSC tint (In NTSC mode only) Range : “5””3”-“9””F” Default : “7””9” ss - reference by Input main select(0x98)
Phase (tuning) control	0x85, nn | “+” | “-” | “?”	Set dot clock phase = value/increment/decrement Query	Dot clock phase. (In PC mode only)
Image H position	0x86, nnnn | “+” | “-” | “?”	Set img_hpos = value/increment/decrement Query	Image horizontal position. (In PC mode only)
Image V position	0x87, nnnn | “+” | “-” | “?”	Set img_vpos = value/increment/decrement Query	Image vertical position. (In PC mode only)
Sharpness	0x8a, nn | “+” | “-” | “r” | “R” | “?”	Set sharpness = value/increment/decrement Reset Query	Sharpness. (Video Mode Source only) Range : “F””4”-“0””C” Default : “0””0”
Frequency	0x8b, nnnn | “+” | “-“ | “?”	Set frequency = Value/increment/decrement Query	Graphic mode H active size (in pixels)

Scaling Mode	0x8c, “0” | “1” | “2” | “3” | “9” | “A” | “B” | “C” | “D” | “r” | “R” | “?”	Set graphic image scaling mode = value Reset Query	Image expansion on/off. “0” – 1:1 “1” – fill screen “2” – fill to aspect ratio “9” – 4:3 “A” – 16:9 “B” – 16:10 “C” – 2.35:1 “D” – 2:1
OSD H position	0x90, nnn | “+” | “-” | “r” | “R” | “?”	Set osd_hpos = value/increment/decrement Reset Query	OSD horizontal position. Range : “0””0”-“F””F” Default : “8””0”
OSD V position	0x91, nnn | “+” | “-” | “r” | “R” | “?”	Set osd_vpos = value/increment/decrement Reset Query	OSD vertical position. Range : “0””0”-“F””F” Default : “8””0”
OSD Transparency	0x92, n | “+” | “-” | “r” | “R” | “?”	Set OSD transparency = value/increment/decrement Reset Query	OSD transparency. “0” – ON “1” - OFF
OSD menu timeout	0x93, nn | “+” | “-” | “r” | “R” | “?”	Select menu timeout = value/increment/decrement Reset Query	OSD menu timeout value. “0””0” – Continuous. value – Round up to nearest available step. if value > max available step, set it to the max available step. Range : “0””5”-“3””C” Default : “0””A”
Select OSD language	0x95, n | “r” | “R” | “?”	Select language = English, Chinese,… Reset Query	“0” – English. “2” - French “3” – Spanish “6” - German “8” – Chinese
Input main select	0x98, nn | “+” | “-” | “r” | “R” | “?”	Select input main = PC or VIDEO or next available Reset Query	Main selected. “0x41,0x31” ARGB “0x42,0x31” Composite “0x42,0x32” Composite2 “0x43,0x31” S-video “0x43,0x32” S-video2 “0x44,0x31” Component “0x44,0x32” Component2 “0x45,0x31” HDSDI “0x45,0x32” HDSDI2 “0x46,0x31” DVI “0x48,0x31” HDMI
Auto Source Seek	0x99, nn , “0” | “1” | “?” | ”o”	Set Auto source enable = *1 Source Disable/ Enable Query Valid Source query	“nn” = “0x41,0x31”- ARGB “0x42,0x31”- Composite “0x42,0x32”- Composite 2 “0x43,0x31”- S-video “0x43,0x32”- S-video 2 “0x44,0x31”- Component “0x44,0x32”- Component 2 “0x45,0x31”- HDSDI “0x45,0x32”- HDSDI2 “0x46,0x31”- DVI “0x48,0x31” HDMI

Source Layout	0x9a, n | “r” | “R” | “?”	Select source layout = Single, PIP, PBP, PBPT Reset, Query	Query: “0”- Single “1”- Picture in Picture (PIP) “2”- Picture by Picture (PBP) “3”- Picture by Picture Tall (PBPT)
Video System (Composite, S-video and Component Only)	0x9b, “0” | “1” | “2” | “3” | “r” | “R” | “S” | “s”| “?”	Set video system = Auto/NTSC/PAL/SECAM Reset Video State Query Query	Query “0” – Auto. “1” – NTSC_M_358 “2” – PAL_N_443 “3” – SECAM “4” – NTSC_M_443 “5” - PAL_M_358 “7” – PAL_M_443 “9” – PAL_N_358 Video State Query “0” – No video. “1” – NTSC “2” – PAL “3” – SECAM “4” – NTSC 443 “5” – PAL M 358
GAMMA value select	0x9d, n | “r” | “R” “?”	Select GAMMA value = Value Reset Query	GAMMA value: “0” – 1.0, “1” – 1.6 “2” – 2.2, “3” – User Defined “4” – 1.7, “5” – 1.8, “6” – 1.9, “7” – 2.0, “8” – 2.1, “9” – 2.3, “A” – 2.4, “B” – 2.5, “C” – 2.6, “D” – 0.6, “E” – 0.7, “F” – 0.8, “G” – 0.9, “H” – 1.1, “I” – 1.2, “J” – 1.3, “K” – 1.4, “L” – 1.5
Auto power off	0x9f, “0” | “1” | “r” | “R” | “?”	Set power down option = On/Off Reset Query	“0” – Off. “1” – On.
Hotkey 1	0xa0, “1”, n | “r” | “R” | “?”	Set Hotkey 1= Value Reset Query	“1” – volume. “2” – brightness. “3” – contrast. “4” – colour. “5” – input source. “7” – zoom “8” – freeze “9” – PIP “B” – No function “D” – PIP Swap “E” – Aspect Ratio “G” – Hue “H” – Backlight “I” – Auto Picture Setup

Hotkey 2	0xa0, “2”, n | “r” | “R” | “?”	Set Hotkey 2 = value Reset Query	“1” – volume. “2” – brightness. “3” – contrast. “4” – colour. “5” – input source. “7” – zoom “8” – freeze “9” – PIP “B” – No function “D” – PIP Swap “E” – Aspect Ratio “G” – Hue “H” – Backlight “I” – Auto Picture Setup
Runtime counter	0xa1, nnnnn | “r” | “R” | “?”	runtime counter value = nnnnn (* 0.5 hour) Reset Query	Runtime = nnnnn.
PIP brightness control	0xa2, nn | “+” | “-” | “r” | “R” | “?”	Set PIP window brightness = value/increment/decrement Reset Query	PIP window brightness. Range : “4””E”-“B””2” Default : “8””0”
PIP contrast control	0xa3, nn | “+” | “-” | “r” | “R” | “?”	Set PIP window contrast = value/increment/decrement Reset Query	PIP window contrast. Range : “1””C”-“E””4” Default : “8””0”
PIP H position	0xa4, nnn | “+” | “-” | “r” | “R” | “?”	Set PIP_hpos = value/increment/decrement Reset Query	PIP window horizontal position. Range : “0””0””0”-“0””6””4” Default : “0””5””5”
PIP V position	0xa5, nnn | “+” | “-” | “r” | “R” | “?”	Set PIP_vpos = value/increment/decrement Reset Query	PIP window vertical position. Range : “0””0””0”-“0””6””4” Default : “0””1””4”
PIP window size select	0xa6, nn | “r” | “R” | “?”	Select PIP window size = PIP window size value Reset Query	Main selected. PIP off if “nn” = “0””0”. “0””0”~”1””2” “0””0” ~ “1””2” “1””9” : Size by Size “1””A” : Size by Size Tall
PIP source select	0xa7, n | “r” | “R” | “?”	Select input main = Video source value Reset Query	Main selected. 0x40 0x30 : PIP OFF 0x41, 0x31 : ARGB 0x42, 0x31 : Composite 0x43, 0x31 : S-video 0x44, 0x31 : Component 1 0x45, 0x31 : HDSDI 1 0x46, 0x31 : DVI 0x42, 0x32 : Composite 2 0x43, 0x32 : S-video 2 0x44, 0x32 : Component 2 0x45, 0x32 : HDSDI 2 “0x48,0x31” HDMI
Zoom level	0xa8, nnnn | “+” | “-” | “r” | “R” | “?”	Set Zoom level = value/increment/decrement Reset Query	Zoom level. Min : 0x30 0x30 0x30 0x30 (Default) Max : 0x30 0x30 0x41 0x33

Zoom H position	0xa9, nnnn | "+" | "-" | "r" | "R" | "?"	Set Zoom_hpos = value/increment/decrement Reset Query	Zoom window horizontal position. Default : 0x30 0x30 0x30 0x30 The min and max values will change depends on input resolution.
Zoom V position	0xaa, nnnn | "+" | "-" | "r" | "R" | "?"	Set Zoom_vpos = value/increment/decrement Reset Query	Zoom window vertical position. Default : 0x30 0x30 0x30 0x30 The min and max values will change depends on input resolution.
Horizontal Size	0xad, nnn | "+" | "-" | "r" | "R" | "?"	Set horizontal size for Aspect Size = value/increment/decrement Reset Query	Scalar horizontal stretch PAL(576i) / NTSC (480i) : Min : 0x30 0x30 0x30 (Default) Max : 0x30 0x46 0x30
Vertical Size	0xb0, nnn | "+" | "-" | "r" | "R" | "?"	Set Vertical Size for Aspect Size = value/increment/decrement Reset Query	Scalar vertical stretch. PAL(576i) / NTSC (480i) : Min : 0x30 0x30 0x30 (Default) Max : 0x30 0x46 0x30
Horizontal Pan	0xb1, nnn | "+" | "-" | "r" | "R" | "?"	Set horizontal pan position for Aspect Size = value/increment/decrement Reset Query	Scalar horizontal pan position PAL(576i) / NTSC (480i) : Assume max H-Size & max V-size : Min : 0x46 0x38 0x38 Max : 0x30 0x37 0x38 Default : 0x30 0x30 0x30 The min and max values will change depends on different value of H-Size, V-Size and input resolution.
Vertical Pan	0xb2, nnn | "+" | "-" | "r" | "R" | "?"	Set Vertical pan position for Aspect Size = value/increment/decrement Reset Query	Scalar vertical pan position PAL(576i) / NTSC (480i) : Assume max H-Size & max V-size : Min : 0x46 0x38 0x38 Max : 0x30 0x37 0x38 Default : 0x30 0x30 0x30 The min and max values will change depends on different value of H-Size, V-Size and input resolution.
Colour temperature select	0xb3, n | "r" | "R" | "?"	Select colour temperature = value Reset Query	Main selected. "0" – 9500K. "1" – 8000K. "2" – 6500K. "3" – 5000K "4" - User

Red level for selected colour temperature	0xb4, nn | "+" | "-" | "r" | "R" | "?" "m" "n" "i" , ss, c, nn "o", ss, c	Set the level of the red channel for the selected colour temp. = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, Temperature Group, value *1 Query, Source *1	Red level for selected colour temperature. Range : "9""C"-"F""F" Default : "E""C" c – reference by Color Temperature ss - reference by Input main select(0x98)
Green level for selected colour temperature	0xb5, nn | "+" | "-" | "r" | "R" | "?" "m" "n" "i" , ss, c, nn "o", ss, c	Set the level of the green channel for the selected colour temp. = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, Temperature Group, value *1 Query, Source *1	Green level for selected colour temperature Range : "9""C"-"F""F" Default : "E""C" c – reference by Color Temperature ss - reference by Input main select(0x98).
Blue level for selected colour temperature	0xb6, nn | "+" | "-" | "r" | "R" | "?" "m" "n" "i" , ss, c, nn "o", ss, c	Set the level of the blue channel for the selected colour temp. = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, Temperature Group, value *1 Query, Source *1	Blue level for selected colour temperature. Range : "9""C"-"F""F" Default : "E""C" c – reference by Color Temperature ss - reference by Input main select(0x98).
Graphic horizontal resolution enquiry	0xb7	Horizontal resolution (in pixels) in 3 digit hex number	"nnn" = horizontal resolution
Graphic vertical resolution enquiry	0xb8	Vertical resolution (in lines) in 3 digit hex number	"nnn" = vertical resolution
Graphic horizontal sync frequency enquiry	0xb9	Horizontal sync frequency (in units of 100Hz) in 3 digit hex number	"nnn" = horizontal frequency
Graphic vertical sync frequency enquiry	0xba	Vertical sync frequency (in units of Hz) in 3 digit hex number and 1 char	"nnnn" = vertical frequency nnn = 3 digit hex c= "i" or "p" interlace or Progressive 0xba added the interlace(i) or Progressive(p) feedback.
OSD status enquiry	0xbb	Status of OSD	"0" – OSD turned off "1" – OSD turned on "2" – Text Overlay on "3" – Display Mark on "4" – Screen Marker on
Display Video Source Select	0xbc, "?" | "0" | "1"	Display Video source select Query Name of video source not displayed. After switching to a new video source, the name of the video source is displayed for 5 seconds.	"0" – Disabled. "1" – Enabled.
OSD turn off	0xbd	Turn off the OSD.	"0" – fail. "1" – successful.

Set gamma data for user defined gamma curve	0xbf, mm, c, "?" 0xbf, "R" | "r" 0xbf, mm, c, nn	Query gamma data for color c index mm (c = 0 for color Red, c=1 for color Green, c=2 for color Blue) Set user gamma curve to linear Set gamma data for color c index mm. (If c= 3, then gamma data for red, green & blue will be set at the same time.)	"nn" = gamma data "1" "nn" = gamma data
Query External Memory	0xcb, "2"	Check External Menory 24c256	"0" – Not Installed "1" – Installed "?" – Not Support
Query Revision Number	0xcb, "3"	Read Revision Number	"nn" = Revision number
Backlight control	0xe0, nn | "+" | "-" | "R" | "r" | "?"	Set Backlight = value/increment/decrement Reset Query	Backlight. Range: D/A : "0""0" ~ "1""6" 100Hz : "0""0" ~ "8""A" 120Hz : "0""0" ~ "7""3" 140Hz : "0""0" ~ "6""3" 160Hz : "0""0" ~ "5""6" 180Hz : "0""0" ~ "4""D" 200Hz : "0""0" ~ "4""5" 220Hz : "0""0" ~ "3""E" 240Hz : "0""0" ~ "3""9" 260Hz : "0""0" ~ "3""5" 280Hz : "0""0" ~ "3""1" 300Hz : "0""0" ~ "2""E" 320Hz : "0""0" ~ "2""B" 340Hz : "0""0" ~ "2""8" 360Hz : "0""0" ~ "2""6" 380Hz : "0""0" ~ "2""4" 400Hz : "0""0" ~ "2""2" 420Hz : "0""0" ~ "2""0" 440Hz : "0""0" ~ "1""F"
Backlight On/Off	0xe1, "0" | "1" | "R" | "r" "?" "S" | "s"	Backlight Off / Backlight On /Status	"0" – Backlight Off "1" – Backlight On. "?" – Backlight On/Off Query "S"|"s" – Backlight Status Query
Color Monochrome mode selection (Output Channel Select)	0xe2 "0" | "1" | "2" | "3" | | "4" | "5" | "6" | "R" | "r"| "?"	Off/ Blue Only/ Red Only/ Green Only/ Blue Mono/ Red Mono/ Green Mono/	"0" – Off "1" – Blue Only "2" – Red Only "3" – Green Only "4" – Blue Mono "5" – Red Mono "6" – Green Mono
PIP Swap	0xe3	Swap Main and PIP source	"0" - Fail. "1" - Successful.
Backlight D/A / PWM	0xe5 "0" | "1" | "R" | "r" "?"	Set : PWM or D/A Reset Query	"0" – PWM "1" – D/A

Backlight PWM Frequency	0xe6, nnn | "+" | "-" | "R" | "r" | "?"	Set Backlight PWM Frequency = value/increment/decrement Reset Query	+/- 20Hz Value 100Hz : "0","6","4" 120Hz : "0","7","8" 140Hz : "0","8","C" 160Hz : "0","A","0" 180Hz : "0","B","4"' 200Hz : "0","C","8" 220Hz : "0","D","C" 240Hz : "0","F","0" 260Hz : "1","0","4" 280Hz : "1","1","8" 300Hz : "1","2","C" 320Hz : "1","4","0" 340Hz : "1","5","4" 360Hz : "1","6","8" 380Hz : "1","7","C" 400Hz : "1","9","0" 420Hz : "1","A","4" 440Hz : "1","B","8"
Backlight Invert	0xe7 "0" | "1" | "R" | "r" "?"	Set On or Off Reset Query	"0" – Off "1" – On
Red Offset for selected colour temperature	0xe8, nn | "+" | "-" | "r" | "R" | "?" "m" "n" "i" , ss, c, nn "o", ss, c	Set the Offset of the red channel for the selected colour temp. = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, Temperature Group, value *1 Query, Source *1	Red Offset for selected colour temperature. c – reference by Color Temperature ss - reference by Input main select(0x98)
Green Offset for selected colour temperature	0xe9, nn | "+" | "-" | "r" | "R" | "?" "m" "n" "i" , ss, c, nn "o", ss, c	Set the Offset of the green channel for the selected colour temp. = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, Temperature Group, value *1 Query, Source *1	Green Offset for selected colour temperature. c – reference by Color Temperature ss - reference by Input main select(0x98)
Blue Offset for selected colour temperature	0xea, nn | "+" | "-" | "r" | "R" | "?" "m" "n" "i" , ss, c, nn "o", ss, c	Set the Offset of the blue channel for the selected colour temp. = value/increment/decrement Reset Query Maximum query *1 Minimum query *1 Set, Source, Temperature Group, value *1 Query, Source *1	Blue Offset for selected colour temperature. c – reference by Color Temperature ss - reference by Input main select(0x98)

PIP Window Blend Level	0xed, nn | "+" | "-" | "R" | "r" | "?"	Select PIP Transparency Level PIP Transparency value Reset Query	PIP Transparency "0"F" = 6.25% "0"E" = 12.5% "0"D" = 18.75% "0"C" = 25% "0"B" = 31.25% "0"A" = 37.5% "0"9" = 43.75% "0"8" = 50% "0"7" = 56.25% "0"6" = 62.5% "0"5" = 68.75% "0"4" = 75% "0"3" = 81.25% "0"2" = 87.5% "0"1" = 93.75% "0"0" = 100%.
PIP Window Auto Off	"0xee", "0x41" "0" |"1" "?"	Auto Off / Auto On Query	"0"- Off "1"- On
ScreenMarker	"0xee", "0x42" "0" |"1"	 Screen Marker Off / Screen Marker On	"0"- Off "1"- On
CenterMarker	"0xee", "0x43" "0" |"1"	 Center Marker Off / Center Marker On	"0"- Off "1"- On
AspectMarker	"0xee", "0x44" "0" |"1"	Preliminary 4:3 /16:9	"0"- 4:3 "1"- 16:9
Marker Background Transparency	"0xee", "0x45" "0" |"1" |"2" |"3"	Preliminary 0% /25%/50%/95%	"0"- 0% "1"- 25% "2"- 50% "3"- 95%
Safe Area Marker*	"0xee", "0x47" "0x53"~"0x63"	Preliminary 80%~99%	"36", "33"- 99% "36", "32"- 98% "36", "31"- 97% "36", "30"- 96% "35", "46"- 95% "35", "45"- 94% "35", "44"- 93% "35", "43"- 92% "35", "42"- 91% "35", "41"- 90% "35", "39"- 89% "35", "38"- 88% "35", "37"- 87% "35", "36"- 86% "35", "35"- 85% "35", "34"- 84% "35", "33"- 83% "35", "32"- 82% "35", "31"- 81% "35", "30"- 80%
IR Lock*	"0xee", "0x48" n | "0" | "1" | "r" | "R" | "?"	IR Lock Disable / IR Lock Enable Reset Query	"0" – IR Lock Disable "1" – IR Lock Enable
Light Detector	"0xee", "0x4A" "0" | "1" | "R" | "r" "?" "S" | "s"	 Light Detector Off / Light Detector On Light Detector On/Off Query Light Detector Value Query	"0" –Light Detector Off "1" –Light Detector On. "?" – Light Detector On/Off Query "S"|"s" –Light Detector Value Query 0x00~0xFF
Safe Area Marker Enable	"0xee", "0x4B" "0" |"1"	Safe Area Marker Off / Safe Area Marker On	"0"- Off "1"- On
Aspect Marker Enable	"0xee", "0x4C" "0" |"1"	Aspect Marker Off / Aspect Marker On	"0"- Off "1"- On

Display real time clock**	“0xee”, “0x4D” “0” |”1”	Real Time Clock Display Off / Real Time Clock Display	“0”- Off “1”- On
Custom Sizing	0xef, “0”	“1”	“2” ”?”	Custom sizing selection : Overscan / Normal / Custom Query	“0” – Overscan “1” – Custom / Underscan “2” – Normal

Function	Command	Description	Acknowledge (if enabled)
Send Display Mark	0xF1, ”S” | ”0x21” | ”0x40” ”0x60” | ”0x7E” Return “1”	“S” = “0x53 or 0x73” ASCII “0x21,0x40,0x60,0x7E” Return “ 0x31”	“S” – Send Command “Text” – Character “1” - successful.
e.g Send Display Mark RS232 Code: “0xF1 0x53 0x21” Return Code: “0xF1 0x53 0x21 0x31”			
Clear Display Mark	0xF1, ”C” Return “1”	“C” = “0x43 or 0x63” Return “ 0x31”	“C” – Clear command “1” - successful.
e.g Clear Display Mark RS232 Code: “0xF1 0x43” Return Code: “0xF1 0x43 0x31”			
Display Mark Horizontal Position	0xF1, |”H” |”ss”| Return “nn”	“H” = “0x48 or 0x68” ---------- “nn” = “0x30,0x30~0x46,0x46”	“H” – Horizontal Position command “ss” – Set Horizontal Position number “nn” – Return Position number
e.g Set Display Mark Horizontal Position RS232 Code: “0xF1 0x48 0x30 0x31” Return Code: “0xF1 0x48 0x30 0x31 0x30 0x31”			
Display Mark Vertical Position	0xF1, |”V” |”ss”| Return “nn”	“V” = “0x56 or 0x76” ---------- “nn” = “0x30,0x30~0x46,0x46”	“V” – Vertical Position command “ss” – Set Vertical Position number “nn” – Return Position number
e.g Set Display Mark Vertical Position RS232 Code: “0xF1 0x56 0x30 0x31” Return Code: “0xF1 0x56 0x30 0x31 0x30 0x31”			
Display Mark Background Transparency	0xF1, |”B”|”N”| Return “n”	“B” = “0x42 or 0x62” Set Transparency command ---------- “N” = “0x30~0x46” Transparency Value (Rang 00~0F)	“B” - Transparency command “N” – Transparency Value “n”- Return Value 0x00 =opaque
Set Display Mark background Transparency value is 8 RS232 Code: “0xF1 0x42 0x38” Return Code: “0xF1 0x42 0x38 0x38”			

Table A-2 - Parameter Setting - Immediate, Relative, Reset and Query

Function	Command	Description	Acknowledge (if enabled)
Select RS-232 acknowledge	0xc1, “0” | “1” | “2” | “3”	Disable/enable command acknowledge.	“0” – acknowledge disabled. “1” – acknowledge enabled. “2” – serial command disabled. “3” – serial command enabled.
Auto-setup	0xc3	Start auto-setup of current vmode.	“0” – fail. “1” – successful.
Command availability	0xc4, n	Check whether a command is available.	“0” – not available. “1” – available.
Auto-calibration	0xc5	Start auto-calibration of gain of the RGB amplifier.	“0” – fail. “1” – successful.
Freeze frame	0xc6, “0” | “1”	Unfreeze / freeze frame	“0” – unfreeze. “1” – freeze.
Soft Power On/Off	0xc8, “0” | “1” | “?”	Soft power off/on query	“0” – Turn off the LCD power and backlight. Turn off memory controller, Power down DVI Power down ADC, Power down Fclk PLL “1” – Turn on the unit
Query video input status	0xc9	Query the status of the primary & pip status	“nn,nn” = input status “nn,xx” digit = primary status: “0”,”0” : invalid “A”,”1” ARGB “B”,”1” Composite “B”,”2” Composite 2 “C”,”1” S-video “C”,”2” S-video 2 “D”,”1” Component “D”,”2” Component 2 “E”,”1” HDSDI “E”,”2” HDSDI 2 “F”,”1” DVI “H” “1” HDMI “xx,nn”= PIP input status: “0”,”0”: invalid “A”,”1” ARGB “B”,”1” Composite “B”,”2” Composite 2 “C”,”1” S-video “C”,”2” S-video 2 “D”,”1” Component “D”,”2” Component 2 “E”,”1” HDSDI “E”,”2” HDSDI 2 “F”,”1” DVI “H” “1” HDMI
Video de-interlace method	0xca, “0” | “1” “r” | “R” “?”	De-interlace mode Reset Query	“3” ”1”- enable AFM “3” ”0”- disable AFM “4” ”1”- enable TNR “4” ”0”- disable TNR “5” ”1”- enable MADI “5” ”0”- disable MADI “7” ”1”- enable DCDi “7” ”0”- disable DCDi

Query BIOS version	0xcb, “0”	Read BIOS version	BIOS version “VV.YY.ZZ” VV = V0 or E0, V0 = Release version E0 = Engineering Sample YY= Version Number ZZ= Customer Number
Query PCBA number	0xcb, “1”	Read PCBA number	“nnnnn” = PCBA number SVX-1920= “41721”
Reset to Factory Defaults	0xce	Reset all parameters to default value	“1” – successful.
Reset to Factory Defaults with (color temp)	0xcf	Reset all parameters for all video modes to default value	“1” - successful.
Saved Calibrated default	0xd7	Saving all parameters to user default value	“1” - successful.
Load Calibrated default	0xd8	Loading all parameters to user default value	“1” - successful. “0” - not successful “E” – Checksum Error
Wide Screen Mode Selection	0xd9, “0” | “1”| “2” “r” | “R” “?”	 Wide Screen Mode Reset Query	“0” – Normal Mode “1” – 1280x768 “2” – 1366x768
ScreenMarker	“0xee”, “0x42” “0” |”1”	 Screen Marker Off / Screen Marker On	“0”- Off “1”- On
CenterMarker	“0xee”, “0x43” “0” |”1”	 Center Marker Off / Center Marker On	“0”- Off “1”- On
AspectMarker	“0xee”, “0x44” “0” |”1”	Preliminary 4:3 /16:9	“0”- 4:3 “1”- 16:9
Marker Background Transparency	“0xee”, “0x45” “0” |”1” |”2” |”3”	Preliminary 0% /25%/50%/95%	“0”- 0% “1”- 25% “2”- 50% “3”- 95%
Safe Area Marker	“0xee”, “0x46” “0x53”~”0x63”	Preliminary 64%~98%	“36”, “33”- 98% “36”, “32”- 96% “36”, “31”- 94% “36”, “30”- 92% “35”, “46”- 90% “35”, “45”- 88% “35”, “44”- 86% “35”, “43”- 84% “35”, “42”- 83% “35”, “41”- 81% “35”, “39”- 79% “35”, “38”- 77% “35”, “37”- 76% “35”, “36”- 74% “35”, “35”- 72% “35”, “34”- 71% “35”, “33”- 69% “35”, “32”- 67% “35”, “31”- 66% “35”, “30”- 64%

Table A-3 - Other Control

Text Via RS232 Command

Function	Command	Description	Acknowledge (if enabled)
Send Line	0xF0, |"S" |"LL"|"TEXT"| "0x0A" Return "1"	"S" = "0x53 or 0x73" Send command --- "LL" = "0x30,0x31~0x30,0x34" Line number (Rang 0~4 lines) --- "Text"= ASCII code, "0x20~0x7E" Character(Rang 0~34) --- 0x0A = End of line	"S" – Send Command "LL" – Line Number "Text" – Character "0x0A" – End of Line "1" - successful.
e.g Display "Send Text" message on screen: RS232 Code:"0xF0 0x53 0x30 0x31 0x53 0x65 0x6E 0x64 0x20 0x54 0x65 0x78 0x74 0x0A" Return Code: "0xF0 0x53 0x30 0x31 0x53 0x65 0x6E 0x64 0x20 0x54 0x65 0x78 0x74 0x0A 0x31"			
Clear Line	0xF0, |"C" |"LL"| Return "nn"	"C" = "0x43 or 0x63" Clear command --- "LL" = "0x30,0x31~0x30,0x34" Line number (Rang 0~4 lines)	"C" – Clear command "LL" – Line Number "nn" – Return Line number
e.g Clear Line 1 RS232 Code: "0xF0 0x43 0x30 0x31" Return Code: "0xF0 0x43 0x30 0x31 0x30 0x31"			
Text Window Horizontal Position	0xF0, |"H" |"ss"| Return "nn"	"H" = "0x48 or 0x68" --- --"nn" = "0x30,0x30~0x46,0x46"	"H" – Horizontal Position command "ss" – Set Horizontal Position number "nn" – Return Position number
e.g Set Text Window Horizontal Position RS232 Code: "0xF0 0x48 0x30 0x31" Return Code: "0xF0 0x48 0x30 0x31 0x30 0x31"			
Text Window Vertical Position	0xF0, |"V" |"ss"| Return "nn"	"V" = "0x56 or 0x76" --- --"nn" = "0x30,0x30~0x46,0x46"	"V" – Vertical Position command "ss" – Set Vertical Position number "nn" – Return Position number
e.g Set Text Window Vertical Position RS232 Code: "0xF0 0x56 0x30 0x31" Return Code: "0xF0 0x56 0x30 0x31 0x30 0x31"			

Left offset	0xF0, |"O" |"SSS"| Return "nnn"	"O" = "0x4F or 0x6F" Set Left Offset command ---------- "SSS" = "0x30,0x30,0x30~ 0x33,0x46,0x46" Offset Value (Rang 000~3ff)	"O" – Left Offset Command "SSS"- Offset Value (pixels) "nnn"- Return Value(pixels)
e.g Set Left Offset = 100 pixels (0x64 (HEX)) RS232 Code: "0xF0 0x4F 0x30 0x36 0x34" Return Code: "0xF0 0x4F 0x30 0x36 0x34 0x30 0x36 0x34"			
Text Window Horizontal Size	0xF0, |"X" |"SSS"| Return "nnn"	"X" = "0x58" Set Horizontal Size command ---------- "SSS" = "0x31,0x45,0x30~ 0x37,0x38,0x30" Horizontal Size Value (Rang 000~3ff)	"X" –Horizontal Size "SSS"- Size Value (pixels) "nnn"- Return Value(pixels)
e.g Set Text Window Horizontal Size = 640 pixels (0x280 (HEX)) RS232 Code: "0xF0 0x58 0x32 0x38 0x30" Return Code: "0xF0 0x58 0x32 0x38 0x30 0x32 0x38 0x30"			
Background Transparency	0xF0, |"B"|"N"| Return "n"	"B" = "0x42 or 0x62" Set Transparency command ---------- "N" = "0x30~0x46" Transparency Value (Rang 00~0F)	"B" - Transparency command "N" – Transparency Value "n"- Return Value 0x00 =opaque
Set background Transparency value is 8 RS232 Code: "0xF0 0x42 0x38" Return Code: "0xF0 0x42 0x38 0x38"			
Text Overlay Background On or Off	0xF0, |"Q"| "N" Return "n"	"Q" = "0x51 or 0x71" Set Background Enable or Disable ---------- "N" = "0x30~0x31"	"B" - command "1" Turn On Text Overlay Background "0" Turn Off Text Overlay Background "n"- Return Value
Set background Transparency value is 8 RS232 Code: "0xF0 0x51 0x31" Return Code: "0xF0 0x51 0x31 0x31"			

Table A-4 – Text Via RS232 Command

Display Mark Command

Function	Command	Description	Acknowledge (if enabled)
Send Display Mark	0xF1, "S" | "0x21" | "0x40" "0x60" | "0x7E" "0x22" | "0x42" # "0x23" | "0x43" # Return "1"	"S" = "0x53 or 0x73" ASCII "0x21,0x40, 0x60,0x7E 0x22, 0x42" # 0x23, 0x43" # Return " 0x31"	"S" – Send Command 0x21 : Full size cell black block 0x40 : Full size cell white block 0x22 : 1/2 cell black block vertical size # 0x42 : 1/2 cell white block vertical size # 0x23 : 8 x 8 triangle (BLACK) # 0x43 : 8 x 8 triangle (WHITE) # "1" - successful.
e.g Send Display Mark RS232 Code: "0xF1 0x53 0x21" Return Code: "0xF1 0x53 0x21 0x31"			
Clear Display Mark	0xF1, "C" Return "1"	"C" = "0x43 or 0x63" Return " 0x31"	"C" – Clear command "1" - successful.
e.g Clear Display Mark RS232 Code: "0xF1 0x43" Return Code: "0xF1 0x43 0x31"			
Display Mark Horizontal Position	0xF1, |"H" |"ss"| Return "nn"	"H" = "0x48 or 0x68" --- --"nn" = "0x30,0x30~0x46,0x46"	"H" – Horizontal Position command "ss" – Set Horizontal Position number "nn" – Return Position number
e.g Set Display Mark Horizontal Position RS232 Code: "0xF1 0x48 0x30 0x31" Return Code: "0xF1 0x48 0x30 0x31 0x30 0x31"			
Display Mark Vertical Position	0xF1, |"V" |"ss"| Return "nn"	"V" = "0x56 or 0x76" --- --"nn" = "0x30,0x30~0x46,0x46"	"V" – Vertical Position command "ss" – Set Vertical Position number "nn" – Return Position number
e.g Set Display Mark Vertical Position RS232 Code: "0xF1 0x56 0x30 0x31" Return Code: "0xF1 0x56 0x30 0x31 0x30 0x31"			
Display Mark Background Transparency	0xF1, |"B"|"N"| Return "n"	"B" = "0x42 or 0x62" Set Transparency command --- "N" = "0x30~0x46" Transparency Value (Rang 00~0F)	"B" - Transparency command "N" – Transparency Value "n"- Return Value 0x00 =opaque
Set Display Mark background Transparency value is 8 RS232 Code: "0xF1 0x42 0x38" Return Code: "0xF1 0x42 0x38 0x38"			

Bi-directional communication between Display Mark and IP50 #	"0xee", "0x64" "0x7B"| "TEXT"| "0x7D" Return "1"	Send command Start Text Command "TEXT" End of Text Command return to CN8 only	"0xee 0x64" – Send Command "0x7B" – Start of Text "Text" – Character (ASCII fomat) "0x7D" – End of Text "1" - successful. (return from CN8)

Display Mark Connect with CN8:
Send Code from **Display Mark**:
0xEE 0x64 **0x7B** 0x4C 0x58 0x3D 0x30 0x0D 0x0A 0x49 0x66 0x20 0x6E 0x6F 0x74 0x20 0x3E 0x33 0x30 **0x7D**
Return Code to **Display Mark**:
0xEE 0x64 **0x7B** 0x4C 0x58 0x3D 0x30 0x0D 0x0A 0x49 0x66 0x20 0x6E 0x6F 0x74 0x20 0x3E 0x33 0x30 **0x7D** 0x31

IP50 Receive code:
0x7B 0x4C 0x58 0x3D 0x30 0x0D 0x0A 0x49 0x66 0x20 0x6E 0x6F 0x74 0x20 0x3E 0x33 0x30 **0x7D**

Display Mark Connect with CN8:
Send Code from **IP50**:
0xEE 0x64 **0x7B** 0x4C 0x58 0x3D 0x30 0x0D 0x0A 0x49 0x66 0x20 0x6E 0x6F 0x74 0x20 0x3E 0x33 0x30 **0x7D**
Return Code to **IP50**:
0xEE 0x64 **0x7B** 0x4C 0x58 0x3D 0x30 0x0D 0x0A 0x49 0x66 0x20 0x6E 0x6F 0x74 0x20 0x3E 0x33 0x30 **0x7D** 0x31

Display Mark Receive code:
0x7B 0x4C 0x58 0x3D 0x30 0x0D 0x0A 0x49 0x66 0x20 0x6E 0x6F 0x74 0x20 0x3E 0x33 0x30 **0x7D**

Table A-5 – Display Mark Command

The RS-232 command strings sent in one time can support up to 380 bytes via CN8 port
The RS-232 command string sent in one time can support up to 50 bytes via CN1 or J1 port.

n = 1-byte ascii-coded hex number, e.g., parameter value of 0x1 is represented by “1” (0x31).
mn or nn = 2-byte ascii-coded hex number, e.g., parameter value of 0x1e is represented by “1”, “e” | “E” (0x31, 0x6e|0x4e).

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
0x30	0	0x41	A	0x61	a	0x2B	+
0x31	1	0x42	B	0x62	b	0x2D	-
0x32	2	0x43	C	0x63	c	0x3F	?
0x33	3	0x44	D	0x64	d		
0x34	4	0x45	E	0x65	e		
0x35	5	0x46	F	0x66	f		
0x36	6	0x47	G	0x67	g		
0x37	7	0x48	H	0x68	h		
0x38	8	0x49	I	0x69	i		
0x39	9	0x4A	J	0x6A	j		
		0x4B	K	0x6B	k		
		0x4C	L	0x6C	l		
		0x4D	M	0x6D	m		
		0x4E	N	0x6E	n		
		0x4F	O	0x6F	o		
		0x50	P	0x70	p		
		0x51	Q	0x71	q		
		0x52	R	0x72	r		
		0x53	S	0x73	s		
		0x54	T	0x74	t		
		0x55	U	0x75	u		
		0x56	V	0x76	v		
		0x57	W	0x77	w		
		0x58	X	0x78	x		
		0x59	Y	0x79	y		
		0x5A	Z	0x7A	z		

Table A-6 - Hex to ASCII Conversion Table

Appendix B – Auto Color Gain

The Auto Color Gain function is supported in the ARGB mode only and is designed to calibrate the controller to the incoming video signal. In order to calibrate correctly, the display must be displaying an image containing both black and white data (see illustration below) when the function is used. The internal processor of the video controller chip will then execute a process to adjust the relative values of the RGB signals to achieve the best performance. The parameters of the corrected RGB values are then stored in the controller and are unaffected by the Reset Factory Defaults function.

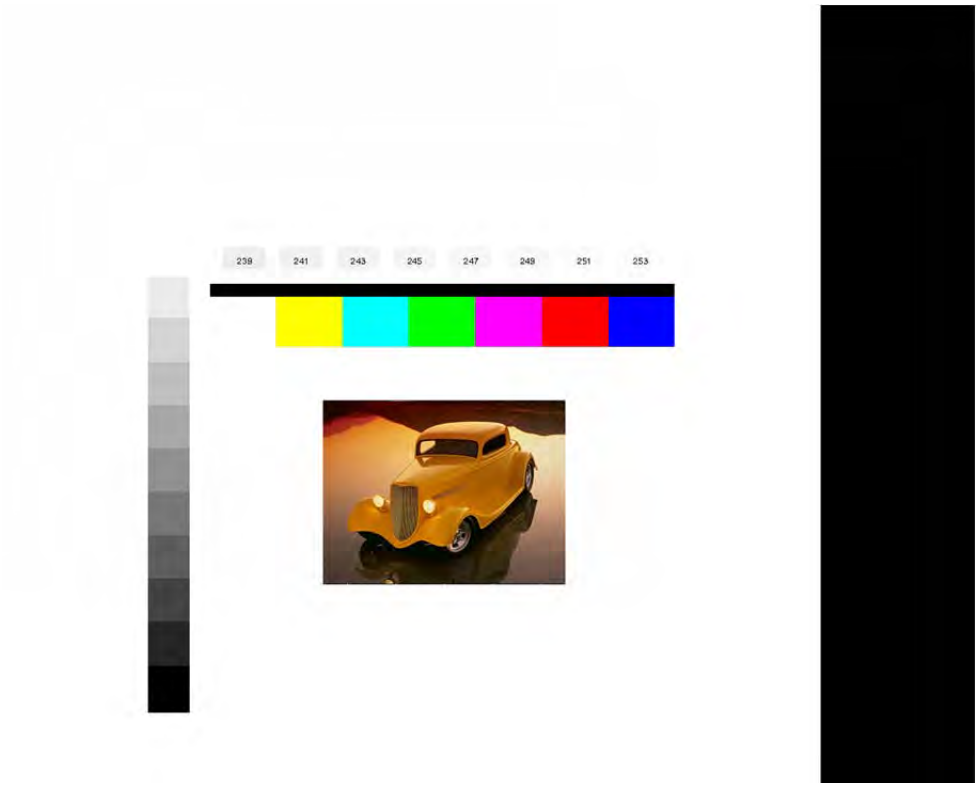


Image B-1 – Auto Color Gain Example

The reference pattern can be downloaded at :
http://www.chassis-plans.com/Rackmount-Keyboard-Displays/TestPattern_1280.bmp

This reference pattern is for 1280x1024 resolution and it needs to set your ARGB input source to 1280x1024 resolution before performing the Auto Color Gain function. The position of the black vertical bar in the pattern at the right side is important. It will affect the calibration result if you are setting the ARGB input to other resolution. This image can be used on the TFX1-19 to correctly set the Auto Color Gain.

Warning - If the Auto Color Gain is executed without an appropriate image being displayed, then the process will set incorrect values and the display colors will be distorted. If this occurs, then it can either be corrected by performing the process correctly or if this is not possible then the Reset Color Gain function can be used. This function will reset the stored RGB values to a set of approximate values.

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Appendix C – Functional Description for De-Interlacing Modes

In the OSD menu, see Utilities – Setup – De-Interlacing Mode

AFM = Auto Film Mode :
It is a frame based method which is used for the input ODD and EVEN fields have a fixed relation between each other, such as static image, 3:2 pull down mode.
If two fields are correctly merged, it can display the best quality. But if it merges two wrong fields, it will have artifacts and display the worst quality.

TNR = Temporal Noise Reduction :
It is a frame based method which assumes field to field have a fixed relationship.
If the object is moving too fast, it will have an image artifact and display worst quality.

MADI = Motion adaptive de-interlacing :
It is a pixel based method which is used when the input fields have no fixed relation between them.
If the object moving too fast, it will get worst quality.

DCDi = Directional Correlation Deinterlacing :
It is a digital enhancement method developed by Faroudja. DCDi technology is primarily used for improving the image quality of low resolution images. This is done by deinterlacing the image and blending rough edges occurring in diagonal lines.

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Appendix D – PIP Mix Table

The TFX1-19 offers PIP (Picture In Picture) and PBP (Picture By Picture) modes. The following table shows which inputs can be combined in these modes.

	VGA	Composite	DVI	HDMI
VGA	X	✓	✓	✓
Composite	✓	X	✓	✓
DVI	✓	✓	X	X
HDMI	✓	✓	X	X

Table E-1 – PIP Mix Table

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Appendix E – Ethernet Network Connection

The TFX1-19 has an RJ-45 Ethernet port for control and monitoring over a network. This appendix introduces the two user interface modes:

- Command line direct mode (this is the default mode)
- Browser based web server mode

There is also a short overview of the command set and how it is implemented in Appendix A.

QUICK GUIDE

Command line direct mode: This is relevant when a PC application is used to send and receive commands over the network port. The LCD Controller with the command line direct mode is installed as default.

The RS-232 commands available are the same as documented Appendix A and writing a control application is very similar to the RS-232 type except the commands must pass through the network. An alternative is to use an application written for RS-232 communication and use a virtual serial port program such as:

One of the software program can be download at http://www.taltech.com/products/tcpcom.html.

This software can create “Virtual” RS232 serial ports that are actually connections to a TCP/IP port. This allows you to use existing Windows based serial communications software to send and receive data across a TCP/IP network.

Please note this is a 3rd party program and is not warranted nor is it the responsibility of Chassis Plans.

Browser based web server mode :
For experienced users the following quick guide to trying out the network connection and functions may be useful.

- Works with a normal network with DHCP, i.e. must use a router.
- Connect the LCD to the network and ensure power is on.
- Use the IP Locator utility available at http://www.chassis-plans.com/ip-locator.zip (Windows only)
- Double click on the IP address in the IP Locator window, it will open the LCD Controller browser page in your default browser. Alternatively copy the IP address into your browser address line.
- Test the functions that come up on the browser.

CAUTION: Configuring TCP/IP settings are complicated and may require an experienced network administrator. For additional help or network configuration, contract your network provider.

Connecting a network port to TFX1-19

Connect the TFX1-19 to the network with a standard Cat-5 Ethernet cable. *Note: A straight RJ-45 cable should be used to connect to the network switch/hub/router.*

Get the IP address using DHCP

When in a default state and powered on, the IP controller will first try to obtain its IP address and network information, such as Subnet Mask address, Gateway address, etc., from the DHCP server. The IP controller may also be configured manually.

If you have a DHCP server on your network, the TFX1-19 automatically obtains its IP address from that server.

- DHCP services must be available on the server.
- If the TFX1-19 and DHCP server are located on different subnets, IP configuration may fail unless the routing device allows the transfer of DHCP requests between subnets.

Web Console

The Web Console is a small web server program (.bin) embedded in the TFX1-19. It provides the user interface that can be accessed and viewed on any standard web browser. The web console provides a platform where you can inquire and control the RS-232 devices which connecting to IP controller.

IP Locator

The IP Locator is a tool to search for any available TFX1-19 connected to the local network within same subnet. If you don't know the IP address of your TFX1-19, the IP Locator program can help you to find the IP address allocated to your TFX1-19. The following example IP Locator's screen shows the devices detected, as well as the IP address, host name and MAC address. *(Please copy the IP Locator from the Chassis Plans website at* www.chassis-plans.com/ip-locator.zip*)*

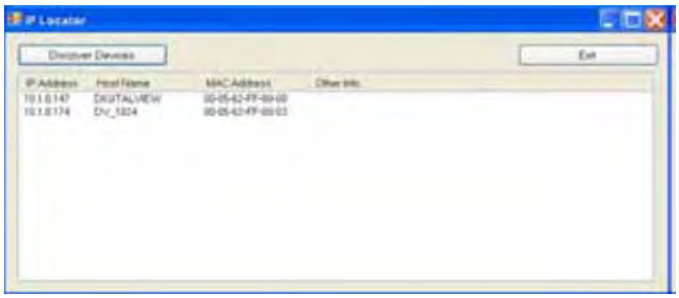

Image F-1 – IP Locator Screen Show

Pressing the Discover Devices button will re-detect the devices and update the screen.

Note: Make sure you have "Microsoft .NET Framework 2.0" already installed on your PC before using the "IP Locator".

Network configuration

To see the network configuration, click **Network** pull down menu will see the table of network settings.

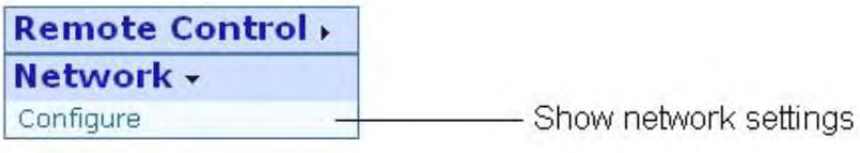

Image F-2 – Network Drop Down

Configure

- Firmware Version — Firmware version of TFX1-19
- MAC Address — MAC address of IP controller
- Host Name — ID name without space (max. 15 character)
- DHCP — DHCP client mode enable/disable
- IP Address — IP address (assigned automatically if DHCP mode enable)
- Subnet Mask — Address Subnet Mask Address
- Default Gateway — Address Network Gateway Address
- Primary DNS Address — Network DNS Address

Image F-3 – Network Configure Settings

In cases where the TFX1-19 is setup behind a firewall and cable/ADSL modem. The following provides details so it can be directly accessed over internet by typing the dedicated IP address on web browser.

Connect to a single TFX1-19

- Connect the TFX1-19 to a router using Cat-5 cable.

- It is suggested to use “DMZ” function on the router. The standard ports required by the TFX1-19 is shown as below:

Port ID	Service	Function
80	HTTP	Access web server
20	FTP (Data)	Web Server program upgrade
21	FTP (Control)	

Table F-1 – Remote Control

To setup DMZ function on your router, you may refer to the following procedure for your reference. (Different routers will has its different setup methods; please refer to the user manual of your router.)

***Step 1*:** Connect to the router and enter into its configuration page.

***Step 2*:** Locate the internal IP address of the TFX1-19. (e.g. 192.168.1.2)

Image F-4 – IP Address Locator

***Step 3*:** Assign the internal IP of the TFX1-19 to DMZ function and enable it.

Image F-5 – IP Address Setting and Enable

In the above example, we can just type **http://148.xxx.27.15** to enter web server of the TFX1-19.

Connect to multiple TFX1-19s

If more than one TFX1-19 are installed at the same location but only has a single IP address to internet, then a router with the NAT, Port forward and firewall function to map different service ports to individual TFX1-19displays is required.

For example:

External Port	Internal Port	Service	LAN IP
9080	80	HTTP	192.168.1.2
9021	21	FTP (Control)	192.168.1.2
9180	80	HTTP	192.168.1.3
9121	21	FTP (Control)	192.168.1.3

Table F-2 – Remote Control

To setup NAT and Port forward function on your router, you may refer to the following procedure for your reference. (Different router will has its different setup method; please refer to the user manual of your router.)

***Step 1*:** Connect to the router and enter into its configuration page.

***Step 2*:** Locate the internal IP addresses of all TFX1-19s. (e.g. 192.168.1.2 and 192.168.1.3)

Image F-6 – DHCP Table Screenshot

***Step 3*:** Set all ports forwarding under NAT function of router. (see the screen below for example.)

Image F-7 – NAT Fowarding Screenshot

In the above example, we have to enter
http://148.xxx.27.15:9080 to access TFX1-19-1 at 192.168.1.2
FTP://148.xxx.27.15:9021 to FTP TFX1-19-1 at 192.168.1.2

http://148.xxx.27.15:9180 to access TFX1-19-2 at 192.168.1.3
FTP://148.xxx.27.15.9121 to FTP TFX1-19-2 at 192.168.1.3

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Appendix F – DVI-D versus DVI-I Connectors

The Digital Visual Interface (DVI) is a video interface standard designed to provide very high visual quality on digital display devices such as flat panel LCD computer displays and digital projectors. It was developed by an industry consortium, the Digital Display Working Group (DDWG). It is designed for carrying uncompressed digital video data to a display. It is partially compatible with the High-Definition Multimedia Interface (HDMI) standard in digital mode (DVI-D), and VGA in analog mode (DVI-A).

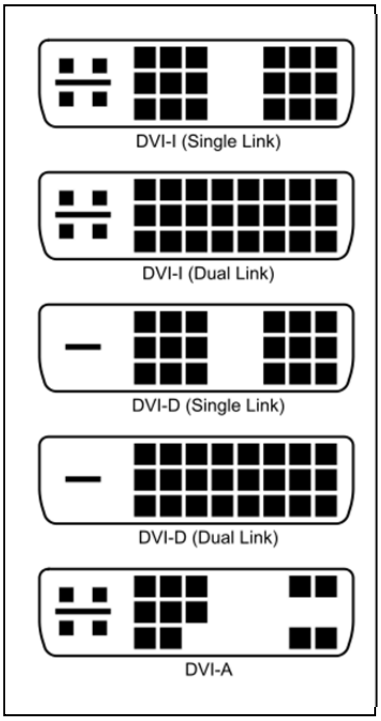
The LCD controller offered with the TFX1-19 offer only DVI-D. This discussion is presented to help clarify the difference between the various flavors of DVI.

Overview

The DVI interface uses a digital protocol in which the desired illumination of pixels is transmitted as binary data. When the display is driven at its native resolution, it will read each number and apply that brightness to the appropriate pixel. In this way, each pixel in the output buffer of the source device corresponds directly to one pixel in the display device, whereas with an analog signal the appearance of each pixel may be affected by its adjacent pixels as well as by electrical noise and other forms of analog distortion.

Connectors

The DVI connector usually contains pins to pass the DVI-native digital video signals. In the case of dual-link systems, additional pins are provided for the second set of data signals.



As well as digital signals, the DVI connector includes pins providing the same analog signals found on a VGA connector, allowing a VGA monitor to be connected with a simple plug adapter. This feature was included in order to make DVI universal, as it allows either type of monitor (analog or digital) to be operated from the same connector.

The DVI connector on a device is therefore given one of four names, depending on which signals it implements:

DVI-D (digital only)
DVI-I (integrated, digital & analog)

The connector also includes provision for a second data link for high resolution displays, though many devices do not implement this. In those that do, the connector is sometimes referred to as DVI-DL (dual link).

The long flat pin on a DVI-I connector is wider than the same pin on a DVI-D connector, so it is not possible to connect a male DVI-I to a female DVI-D by removing the 4 analog pins. It is possible, however, to connect a male DVI-D cable to a female DVI-I connector. Many flat panel LCD monitors have only the DVI-D connection so that a DVI-D male to DVI-D male cable will suffice when connecting the monitor to a computer's DVI-I female connector.

Essentially, DVI-D is the same as DVI-I with DVI-D missing the analog portion of the signals. A DVI-D connector and monitor can connect to a DVI-I output and function. A DVI-I monitor can connect to a DVI-D output with the caveat that no analog video will be available.

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